FEBRUARY, 1954

TOOLING and PRODUCTION

The Magazine of Manufacturing Management

5TH ANNUAL CARBIDES FEATURE ISSUE

CARBIDE
Tool Evaluation

•

PRECISION BORING
with Cemented Carbides

•

CARBIDE
Lamination Dies

•

CARBIDE TOOLING
for Automation

•

CARBIDE TIPS
on Machining Titanium

•

QUALITY CONTROL
of Carbide Tools

•

Turbo Engine
AUTOMATION

•

ELECTRONIC
CONTRIBUTIONS
to Safety and Production

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NEWS OF
People, Products,
Plants and Processes

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CCA

OUT OF THIS WORLD...
American's DRILL JIG BUSHING and the Amazing WESTINGHOUSE ROBOT "ELEKTRO"
American has established a new standard for service, reliability and quality for drill jig bushings. Their KING SIZE selection of A.S.A. and American Standard types of sizes, and the original 3-D simplified method of ordering from exclusive distributors everywhere,are OUT OF THIS WORLD!
Look for us at the A.S.T.E. Industrial Exposition and see the amazing Westinghouse Robot "ELEKTRO" in American's Booth.
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EXHIBIT BOOTH = 1234
We invite you to come in and see the amazing Robot Show in our auditorium at the A.S.T.E. Industrial Exposition, Philadelphia, April 26-30, 1954.
AMERICAN DRILL BUSHING CO.
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FEATURING THE ORIGINAL 3-D SIMPLIFIED METHOD OF ORDERING
American
DRILL BUSHING CO.
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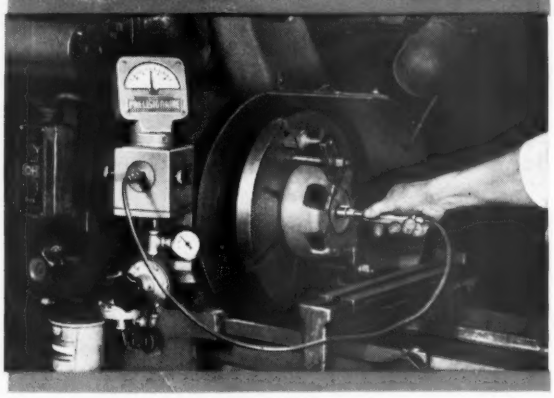
ELEKTRO



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- It is small, compact and sturdy enough to withstand rough handling in the shop.

Gage Division, The Sheffield Corporation
Dayton 1, Ohio, U.S.A.

ASK FOR A DEMONSTRATION IN YOUR PLANT

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6277

Save Time and Tools on the Big Jobs
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POSTIV-LOK
END MILLS
Putnam takes the shank off the end mill . . .
. . . puts it on a holder that soon pays for itself.
Postiv-Lok adapters simplify change-over to small end mills, shell end mills and drills.

Eliminate integral tapered shanks and cumbersome tool changing on heavy end mill jobs with the new, proven Postiv-Lok end mills. They'll cut your end mill costs up to 25%, give smooth, chatter-free cutting through torque-aided locking. Write for catalog on your letterhead.

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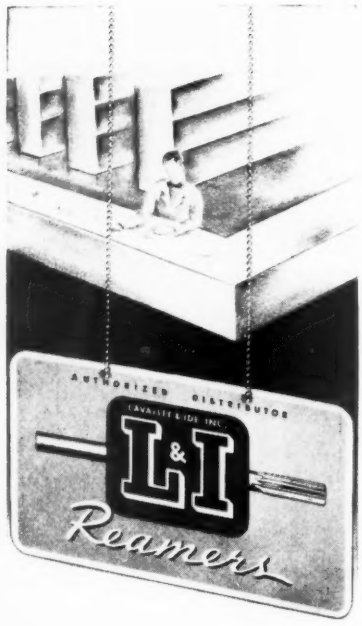

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is your guarantee of top performance ..in a reamer ...in a distributor.

L&I *The Reamer Specialists*

LAVALLEE & IDE, INC.
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TOOLING and PRODUCTION

The Magazine of Manufacturing Management

formerly
Tool-Die-Machine PROGRESS 1934-1941
TOOL & DIE JOURNAL 1941-51

Vol. XIX—No. 11 February, 1954

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TOOLING and PRODUCTION'S great appeal is to those men who operate the plants and divisions of industry, their production departments and their toolrooms. It is they who collectively are charged with the responsibility of manufacturing their companies' products precisely, efficiently and profitably.
They have the influence that enables them to adopt the ideas and the processes which TOOLING and PRODUCTION describes in every issue AND the authority to recommend, to specify and/or to buy everything that may be needed to reduce costs, increase production or improve quality. These men for whom, each month, our editors seek out or write TOOLING and PRODUCTION'S meticulously accurate stories of "Know-How" and "Tell-How" are T & P's exclusive Cycle of Buying Influence (CBI) in their plants.
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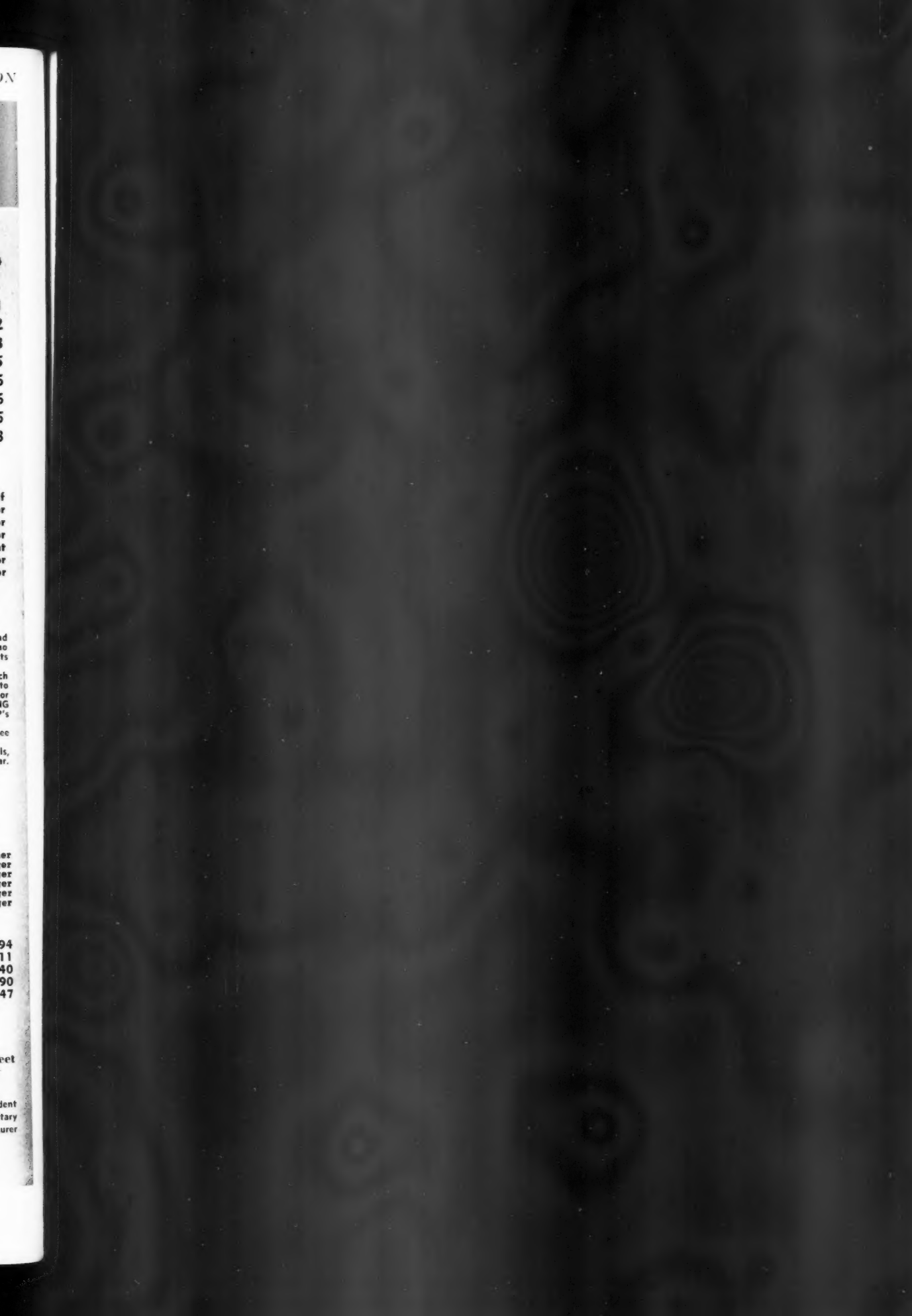
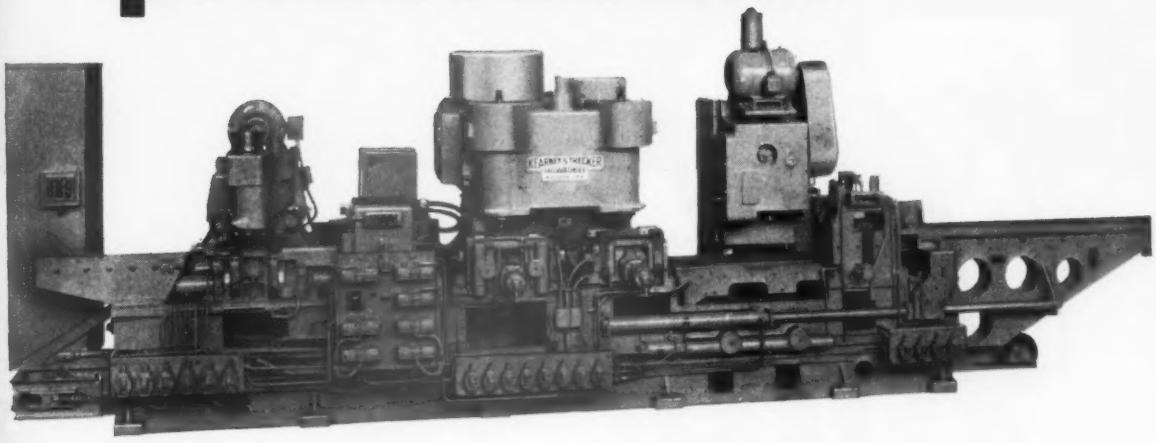
The Know-How-Library of Tooling and Production



Talk about production...

Builders of Precision and Production Machine Tools since 1898

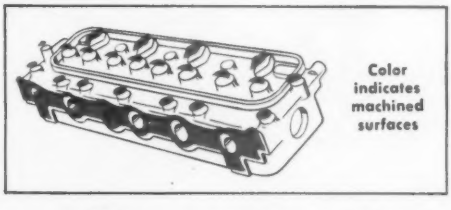


For the customer . . .

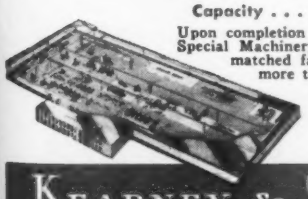
it put a one-at-a-time rough and finish milling job on a production basis!

THIS special seven-station traveling head transfer type milling machine solved an automotive manufacturer's problem that involved milling cylinder heads. Formerly, rough and finish milling of a six-cylinder head required six distinct machining operations and seven separate handlings. Now, by combining all the machining operations and eliminating handling... the special machine produces 62 finished pieces per hour.

TRAVELING HEADS . . . three heads — one with one spindle and two with three spindles. Full quill adjustment on all spindles. Speeds are fixed. Heads travel hydraulically on hardened and ground ways.



Color indicates machined surfaces



Capacity . . . Experience . . . Performance

Upon completion of this $5,200,000 expansion of our Special Machinery Division, we offer you (1) unmatched facilities, (2) experience based upon more than 50 years in the design and production of special machinery, and (3) performance, best recommended by our outstanding record of successfully solving many hundreds of unusual machining problems.

For more details on this machine . . .

ask for *Data Sheet No. 1003.* Free booklet, "Doorway to a proven method for solution of big and small metalworking problems" is also yours for the asking. *Write today to* SPECIAL MACHINERY DIVISION, KEARNEY & TRECKER CORP., 6784 West National Ave., Milwaukee 14, Wisconsin.

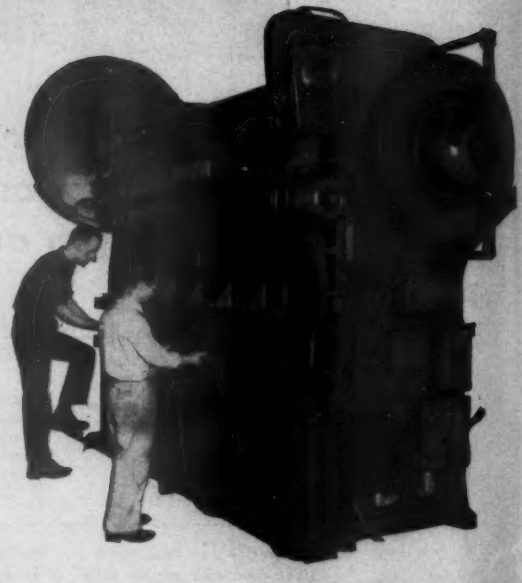
KEARNEY & TRECKER CORP. · *Special Machinery Division*
MILWAUKEE 14, WIS., U. S. A.

CIRCLE INFORM-A-GRAM KEY NO. 5

Photos courtesy Kirk & Blum, Cincinnati, Ohio

72 HOLES

where they belong



Economical assembly depended on maintaining the accurate spacing of these 72 holes and their accurate positioning on this 10-gauge sheet.

This Cincinnati Press Brake is giving a high production at low cost by its speed and accuracy of performance, which insures rapid low cost assembly.

As a press, they offer high production with low investment. As a Press Brake, their low set-up costs, quick change-overs and versatility bring profits.

Write for Catalog B-4 where many examples of the versatility of Cincinnati Press Brakes are illustrated.

CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

you'll be glad you switched to BALAS

5C Lathe Collet

22 Brown & Sharpe Collet

1" R&RA Acme Gridley Collet

Davenport Collet

22 Brown & Sharpe Feed Finger

14" AC Warner & Swasey Collet

1½" Cone Collet

there are GOOD Balas COLLETS

1⅛" # 61 New Britain Master Collet

in stock for your automatics, lathes and milling machines

BALAS ALSO MAKES

- Master Collets and Pads
- Pushers and Feed Fingers
- Master Pushers and Pads
- Ejector Collets
- Collet Sleeves and Chuck Nuts for B.&S. Machines
- Carbide faced Stock Stops for B.&S. Machines

You can pay thousands of dollars for a machine tool and still get inferior results if you don't use the best collet.

Leading manufacturers are getting outstanding results with Balas Collets... saving time and money on every operation.

Balas Collets, because of their exclusive features, grip tighter and operate faster in the chucking mechanism. By using selected alloy steels, by proper heat-treating and by "cam grinding" on the taper, Balas Collets have qualities that give you longer, continuous trouble-free runs. Precision engineering and rigid inspection insure the maximum accuracy.

A large number of sizes are carried in stock for immediate delivery. Insist on Balas Collets—you'll save time, material and money.

BALAS COLLET MANUFACTURING CO.

CLEVELAND 14, OHIO

REPRESENTATIVES IN Brockport, N.Y.; Atlanta, Ga.; Moline, Ill.; Houston, Tex.; Minneapolis, Minn.; Omaha, Neb.; Shreveport, La.; Detroit, Mich.; Philadelphia, Pa.; Indianapolis, Ind.; Oakland, Calif.; Newark, N.J.; Cleveland, Ohio; Kansas City, Mo.; Glendale, Calif.; Madison, Conn.; Chicago, Ill.; St. Louis, Mo.; Flint, Mich.; Westbury, N.Y.; Portland, Ore.; Denver, Col.; Brantford and Montreal, Canada.

CIRCLE INFORM-A-GRAM KEY NO. 7

MACKLIN

Announces New M. M. Carbide Cutting Wheel With Added Abrasive

Revolutionary in methods and manufacture, the new M M wheel, embedded with loose abrasives, is setting sensational records in grinding carbide tools. In some cases it has reduced grinding time 50%, increased wheel life 300%. Write Dept. 75 for literature and complete information.

MACKLIN COMPANY

Manufacturers of GRINDING WHEELS AND OTHER ABRASIVE PRODUCTS

JACKSON, MICHIGAN

Sales Offices - Birmingham - Buffalo - Chicago - Cincinnati - Cleveland - Columbus - Detroit - Flint - Houston Indianapolis - Los Angeles - Milwaukee - Moline - New York - Philadelphia - Pittsburgh - St. Louis

CIRCLE INFORM-A-GRAM KEY NO. 8

New! Low Cost! **RENTAL PLAN** *Electronic* for INDUCTION HEATING and DIELECTRIC HEATING GENERATORS!

AMERICA'S FINEST HIGH PRODUCTION EQUIPMENT for BRAZING

HARDENING
SOLDERING
ANNEALING
CORE BAKING

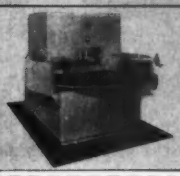
5 to 75 KW INDUCTION GENERATORS

Bench-Type Two Position 2½, 3½, 4½ KW INDUCTION GENERATORS

Bench-Type Single Position 1 KW INDUCTION GENERATORS

LAB UNITS Combination 5 KW DIELECTRIC and INDUCTION GENERATORS

ELECTRONIC CORE BAKERS
Capacities from 500 to 8,000 lbs. per hour!



Turntable CORE BAKERS for One-Man Core Room Operation!

THER-MONIC Rental Plan

— is many ways advantageous

Tax-wise! . . . Capital-wise! . . . Productivity-wise!

As approved by the Internal Revenue Bureau, this plan permits acquired new equipment to be regarded as an expense—payable out of earnings before taxes!

And . . . in that Induction Heating Equipment pays for itself out of created profits, it lightens the fixed assets' load—frees capital—and enables industry to satisfy its dire need for modern, more efficient, competitively effective modernization.

The Ther-monic Rental Plan incorporates a nominal ($200.) installation charge—and schedules low monthly rates that further reduce themselves annually.

Special brochure describes this welcome new arrangement. May we send you a copy? Write today!

INDUCTION HEATING CORPORATION
181 WYTHE AVENUE • BROOKLYN 11, N. Y.
Largest Producers of Electronic Heat Treating Equipment

INDUCTION HEATING CORP. Dept. TP
181 Wythe Avenue, Brooklyn 11, N. Y.
Gentlemen:
The Ther-monic Rental Plan interests me!
☐ Mail descriptive brochure!
☐ Have your representative call!
Name_____
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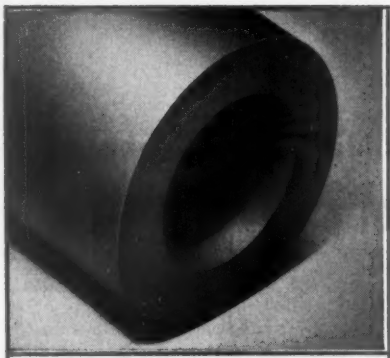
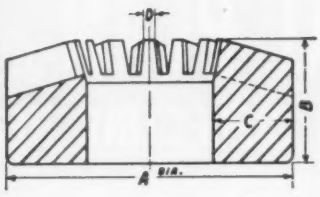
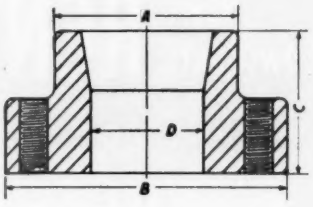


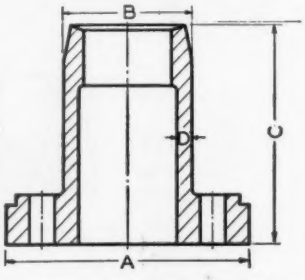
PERFORATING DIE



SIZING DIE



FORMING AND PIERCING DIE



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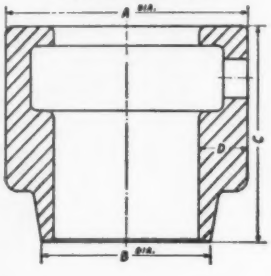
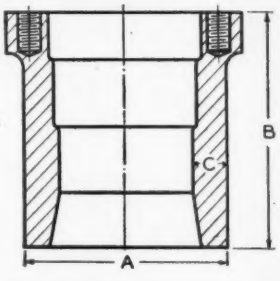


BLANKING AND FORMING DIE



How Graph-Mo® Hollow-Bar speeds production of ring-shaped tool steel parts like these

New GRAPH-MO® HOLLOW-BAR eliminates drilling—and machines 30% faster

IF you make ring-shaped tool steel parts, you can start with finish boring by using Graph-Mo® Hollow-Bar. There's no drilling—the hole's already there. You speed production, cut scrap waste and save steel.

At the same time, you get all the proved advantages of Graph-Mo. Because of the free graphite in its structure, Graph-Mo machines 30% faster than other tool steels; has a minimum tendency to pick up, scuff or gall. And the combination of free graphite and diamond-hard carbides gives Graph-Mo Hollow-Bar exceptional durability. Users report that it outwears other tool steels on an average of 3 to 1.

Stability tests prove Graph-Mo is the most stable tool steel ever made. For example, after 12 years a typical Graph-Mo steel master plug gage showed less than 10 millionths of an inch dimensional change. It responds uniformly to heat treatment, too.

Make sure you're getting all the advantages of Graph-Mo Hollow-Bar if you make ring-shaped tool steel parts. Sizes range up to 16″ O.D. with a variety of wall thicknesses. Graph-Mo Hollow-Bar is distributed through A. Milne and Co. and Peninsular Steel Co. warehouses.

For more information about Graph-Mo Hollow-Bar, write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

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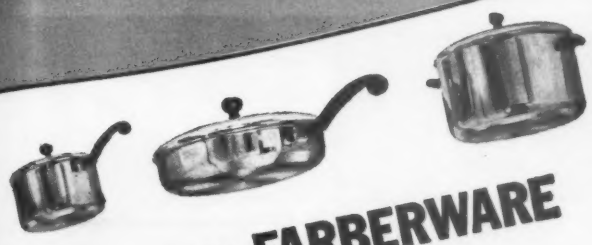
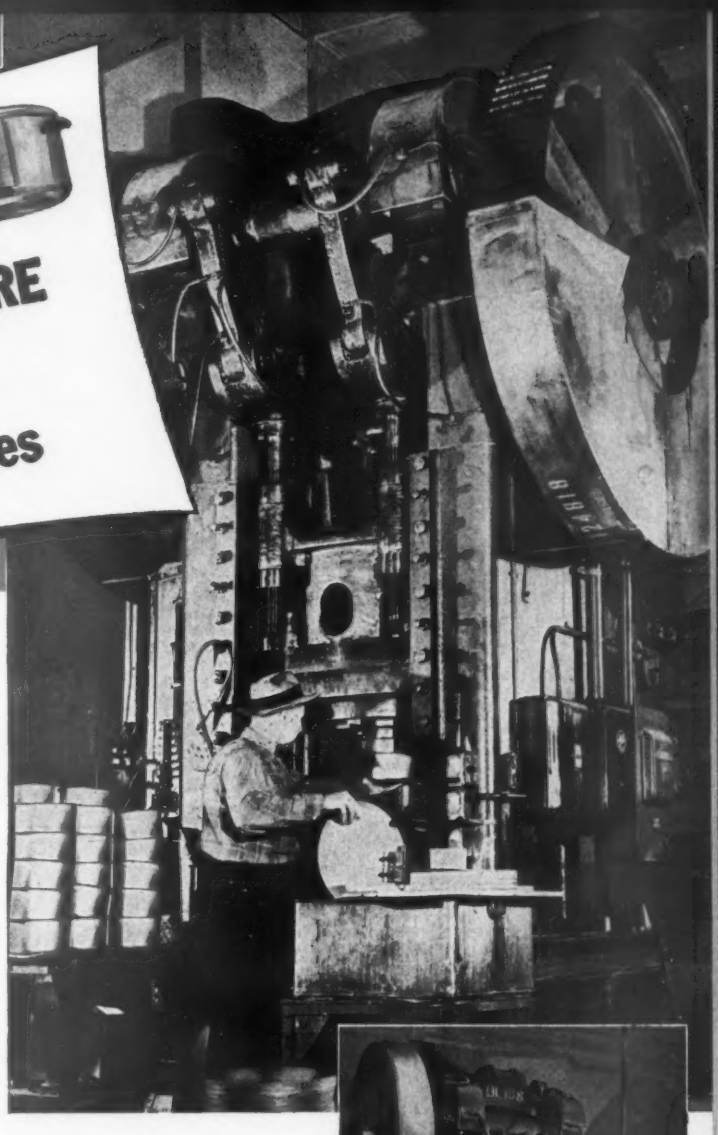


Famous FARBERWARE is 100% BLISS in drawing presses



Famous Farberware begins with the finest stainless. And for dependable deep-drawing of stainless blanks, S. W. Farber, Inc. relies on Bliss toggle drawing presses—and has since 1917.

Today, the two Farberware plants are *100% Bliss* on drawing presses; *85% Bliss* on all other types.

Proven performance is the reason for this choice, of course. But here are a few of the specific operating advantages cited by H. M. Harrison, Vice President of S. W. Farber, Inc.:

1. Precision action delivers uniformly high-quality parts; keeps rejects at a minimum.
2. Bliss toggle presses are easy to set up, easy to change over; give trouble-free operation.
3. Maintenance requirements are nominal—adjustments are made quickly and easily when needed. (Floor level greasing system is a typical convenience.)

Perhaps Bliss toggle presses can solve your special deep-draw problems, too. But whatever your problems, if you're looking for high-quality, high-speed production in your press department, call a Bliss engineer. He will be glad to help you choose the *right* press for the job—mechanical or hydraulic—because Bliss makes them all.

1750 POTS IN EIGHT HOURS—that's the average production rate on this 5-S Bliss toggle. The four-quart pot is drawn 4½ inches deep in one operation from a 15-inch diameter blank of stainless.

SMOOTH BULGE on this pot cover makes it easy to clean—but calls for good press work. A rubber die is used with this 3½-B toggle press to perform this operation.

BLISS on your press is more than a name... it's a *guarantee*

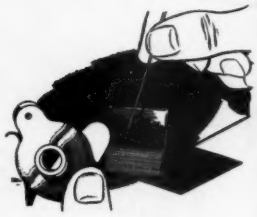
E. W. BLISS COMPANY, Canton, Ohio

PRESSES, ROLLING MILLS, SPECIAL MACHINERY

E. W. Bliss (England) Ltd., Derby, England • E. W. Bliss Company (Paris), St. Ouen sur Seine, France

U. S. Plants in Canton, Salem and Toledo, Ohio; and Hastings, Michigan. *Branch Offices* in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Toledo; and Toronto, Canada. *West Coast Representatives:* Moore Machinery Co., Los Angeles and San Francisco; Star Machinery Company, Seattle. *Other representatives throughout the world.*

Two UNBRAKO Self-Locking Socket Set Screws are used on each cam of these precision multicircuit cam timers. The screws position the cams so as to control accurately the sequence and duration of one or a series of individually timed machine or process operations.



Assembler picks up tiny UNBRAKO set screw with long arm key preparatory to threading it into cam assembly.

He inserts the UNBRAKO, and turns it into the assembly; then after positioning cam, tightens it. The accurate depth and size of the hex socket result in maximum torquing—the knurled cup point holds the cam accurately in place.

UNBRAKOS—made of heat treated alloy steel—have fully formed threads, Class 3 fit; are supplied in standard sizes from #4 to 1".

You'll need less space for storage when you use UNBRAKO Standards—stocked by your distributor

You'll need less space for storage and be able to carry a smaller inventory, because standard UNBRAKO socket screw products are in stock at your local industrial distributor's. And you'll save time and money, because deliveries are prompt. For more information, write for UNBRAKO Standards—a complete listing of socket screw products made by the world's largest manufacturer of these precision fasteners. STANDARD PRESSED STEEL Co., Jenkintown 36, Pa.

UNBRAKO® SOCKET SCREW DIVISION

SPS JENKINTOWN PENNSYLVANIA

CIRCLE INFORM-A-GRAM KEY NO. 12

"Standards" by WAUKESHA

. . . meet most of your Cutting Tool Needs . . . most of the time!

The use of Waukesha Standard Inserted Blade Reamers, Spade Drills and Counterbores eliminates substantial investments in "special tooling". The adjustability, adaptability and ready availability of standard Waukesha Cutting Tools save costly engineering time, eliminate down time for new tooling. You can make savings in your cutting tool costs by specifying Standard WAUKESHA Cutting Tools.

consult WAUKESHA

. . . for competent cutting tool counsel. Waukesha sales representatives and engineers are qualified to work with your own staff in adapting standard Waukesha Tools to your needs . . . or in the development of special cutting tools.

INSERTED BLADE SPADE DRILLS

Lower in cost than solid twist drills. Holder lasts indefinitely. Only blades need be replaced — assuring low maintenance cost. 1-1/32" to 5" diameter stocked for immediate delivery.

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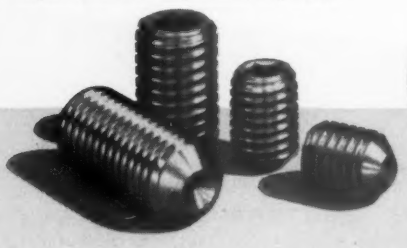
NEW

Allenpoint Set Screws

WITH SCIENTIFICALLY-DESIGNED SMALLER CUP POINTS

Tested comparatively by United States Testing Company* with standard cup point screws and screws with angled and serrated points, the new Allenpoint demonstrated (1) greater locking power at *all* measured installation vs removal torque pressures, (2) uniformly high shaft holding power in torque resistance tests, (3) unmatched performance under vibration, and (4) more complete shaft contact pattern. Sold *only* by leading Industrial Distributors. Write us for more facts about the results of these important tests of set screw performance.

**Report No. E 5576, March 17, 1953.*



ALLEN

MANUFACTURING COMPANY

Hartford 2, Connecticut U.S.A.

ALLEN HEAD

CIRCLE INFORM-A-GRAM KEY NO. 14

Latrobe's new high speed steels

with

"Built-in" sulphide lubricants

assure

lower cost through higher production

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LATROBE STEEL CO., Latrobe, Pa. TP-2

Please send data on "XL" steels to:

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POSITION _____

COMPANY _____

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CITY _____ STATE _____

Latrobe STEEL COMPANY

LATROBE, PENNSYLVANIA

Branch Offices and Warehouses • Boston Buffalo Chicago Cleveland Dayton Detroit Hartford Hillside Los Angeles Milwaukee Philadelphia Pittsburgh St. Louis Toledo

Sales Agents • Dallas Denver Houston Salt Lake City Seattle Wichita

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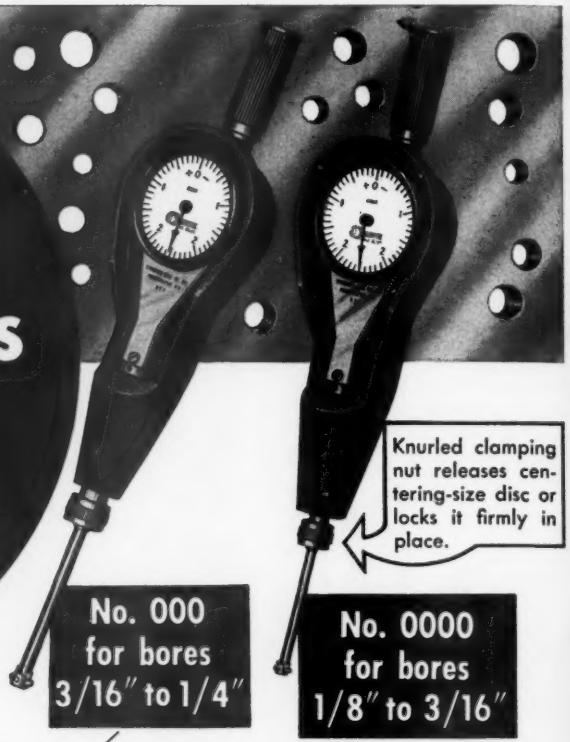
NOW!—DOWN TO 1/8"

Two New Dial Bore Gages for measuring 1/8" and 3/16" bores

Patent Applied For


Knurled clamping nut releases centering-size disc or locks it firmly in place.
No. 000 for bores 3/16" to 1/4"
No. 0000 for bores 1/8" to 3/16"

These two new STANDARD developments extend the effectiveness of STANDARD Dial Bore Gages to quick, accurate, quantitative inspection of bores down to as small as ⅛" diameter. They utilize the "centering-size disc" principle, tested-in-use with similar but slightly larger gages.

* Hold settings positively
* Give reliable repeat readings
* Sapphire tipped gaging plungers and chrome-plated centering-size disc insure long gaging life
* High visibility dial graduations of .0001 are easy to read
* "Capstan" adjusting disc facilitates adjustment when zeroing instrument.

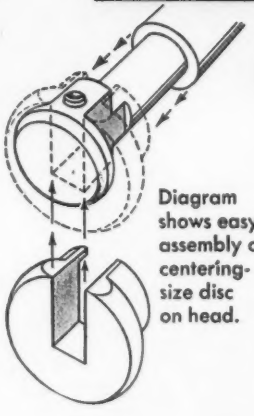


Diagram shows easy assembly of centering-size disc on head.

EASY "SIZE CONVERSION"

Conversion to various sizes in the over-all range of the gage is accomplished by the quick interchange of centering-size discs on the same head simply by turning the knurled clamping nut. Positive interlocking action insures holding set dimension. Centering-size discs are furnished to fit bore dimensions specified by the user, or in complete sets.

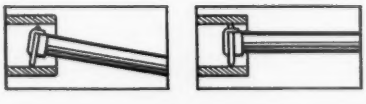
AVAILABLE AS ONE-DIMENSION OR FULL-RANGE GAGE

When either gage is supplied with set of discs, any dimension within its over-all range can be measured with a tolerance up to plus or minus .002".

STANDARD Dial Bore Gages now in 10 sizes covering range from ⅛" to 16"

Write for full details

EASE OF OPERATION



Gage is entered at an angle to allow extended plunger to clear the bore, then rocked to cause plunger to pass a square position while noting minimum reading on the indicator.

STANDARD Gage Co., Inc.
POUGHKEEPSIE, N.Y.

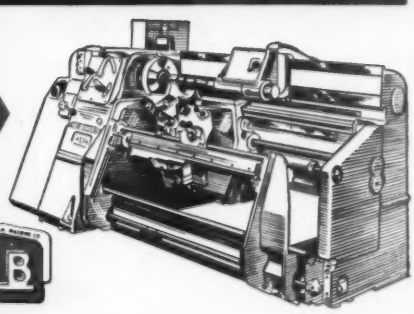
CIRCLE INFORM-A-GRAM KEY NO. 16

Contour facing (illustrated) and contour boring, as well as shaft turning, are normal operations from a template or prototype on a New Britain +GF+ Copying Lathe.

THE NEW BRITAIN MACHINE COMPANY
New Britain-Gridley Machine Division, New Britain, Connecticut

NEW BRITAIN *Automatics*

Machines for Making Progress
Automatic Bar and Chucking Machines
Precision Boring Machines
Lucas Horizontal Boring, Drilling and Milling Machines
New Britain +GF+ Copying Lathes

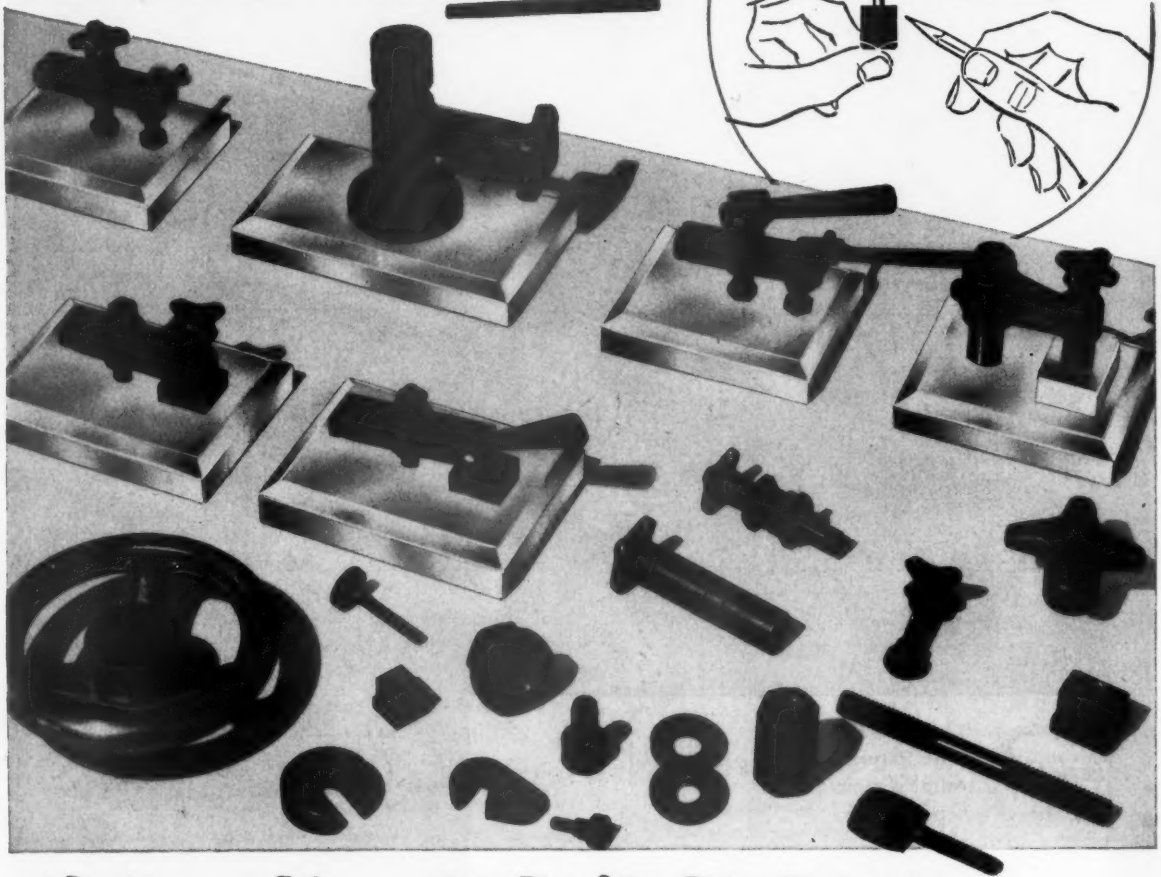


CIRCLE INFORM-A-GRAM KEY NO. 17

In Jig and Fixture Components . . .

You Get The BEST

Greater uniformity, higher strength, longer life are provided by quarter-turn screws from *forgings*. All Lodding fixtures Parkerized to prevent rust.



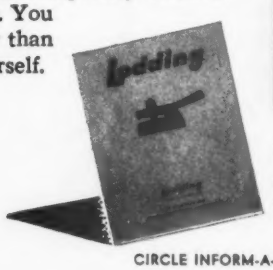
When You STANDARDIZE With

YOU GET WHAT YOU WANT

Here in the Lodding Line you will find standard assemblies and details to meet your every need — all the components necessary to standardize engineering practice, save design and labor costs.

AND YOU GET IT QUICKLY

Immediate shipment from completely stocked, coast-to-coast distributors. You receive parts much faster than you can make them yourself.



Lodding INC.

81 BEACON ST., WORCESTER 1, MASS.

THE STANDARD LINE OF JIG AND FIXTURE COMPONENTS

Write for Catalog — *includes full-scale layouts of every Lodding fixture. Template sheets available. No obligation.*

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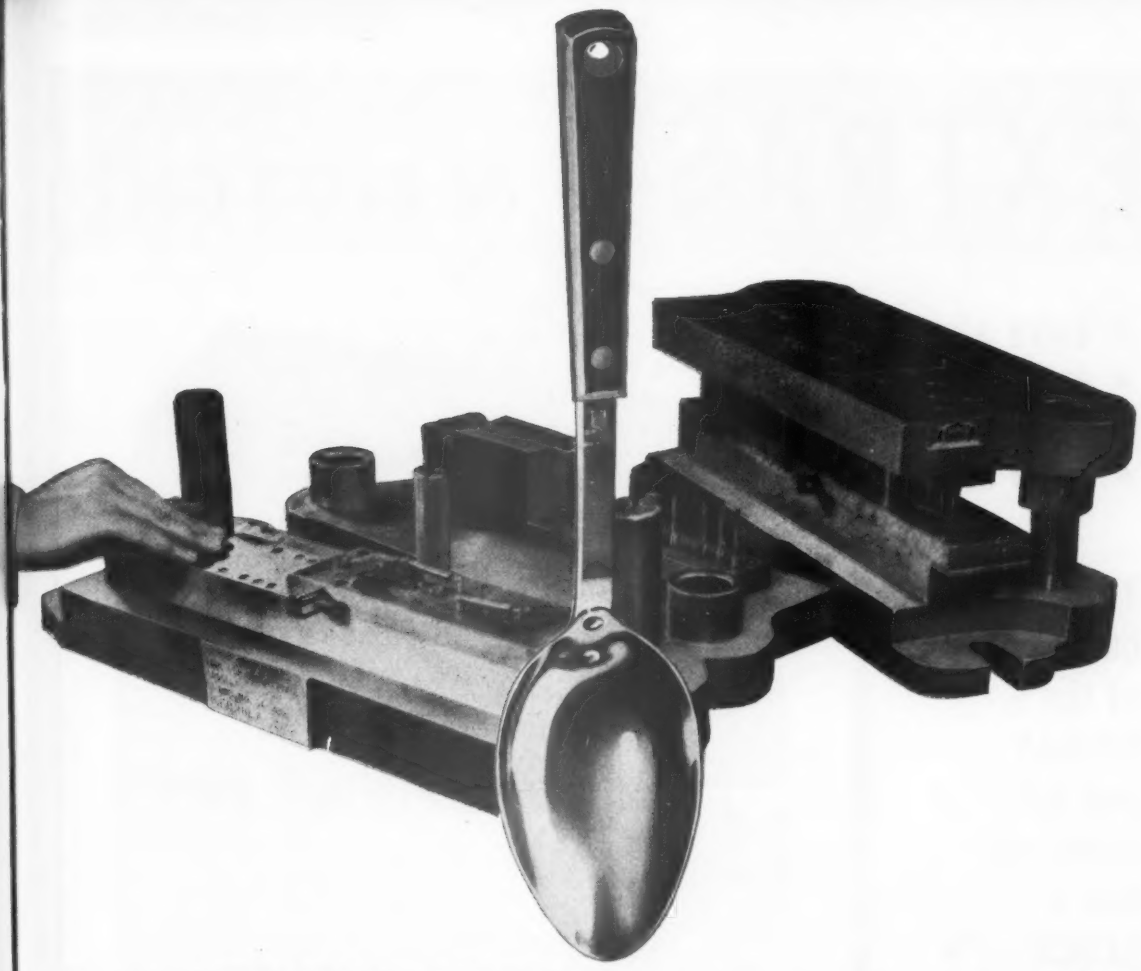
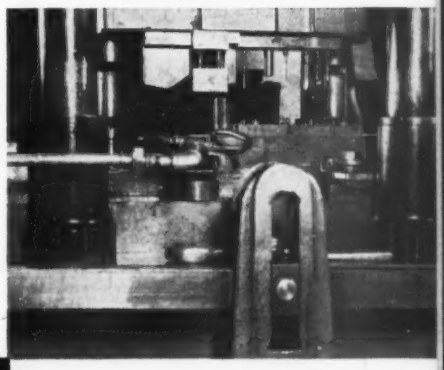


Ekco DEPENDS ON DANLY to save tooling time!

This popular basting spoon is one of thousands of famous household items made by Ekco Products Company in dies mounted in Danly Die Sets. Ekco depends on Danly Die Sets to save costly tooling time and help maintain uninterrupted production schedules in this highly competitive industry, because Danly Die Sets provide the finest *precision* starting point for diemaking. They are available on short notice from a completely stocked Danly assembly plant nearby.

It's a point worth remembering . . . when the job calls for *precision* performance, *depend on Danly Die Sets!* There's a Danly Branch near you . . . stocked for immediate delivery.



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***CLEVELAND**	14	1550 East 33rd St.
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***DETROIT**	16	1549 Temple Ave.
***GRAND RAPIDS**		113 Michigan St., N.W.
INDIANAPOLIS	4	5 West 10th St.
***LONG ISLAND CITY**		47-28 37th St.
***LOS ANGELES**	54	Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE	2	111 E. Wisconsin Ave.
***PHILADELPHIA**	40	511 W. Courtland St.
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****Indicates complete stock***

DANLY

DIE SETS . . . STANDARD OR SPECIAL
DIEMAKERS SUPPLIES

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EXTRAS at no extra cost

★ extra adjustment of ram
★ extra throat depth
★ extra die space
★ extra stroke

These are but a few of the EXTRAS you get when you buy a SEMCO PRESS BRAKE Sizes— 6 foot and 8 foot

Motorized ram adjustment available

Extra quality, accuracy and strength is assured as the extra heavy hot rolled steel frame is of a single weldment normalized before machining. All parts are engineered and manufactured for interchangeability and accuracy.

The one piece forged alloy steel crankshaft is your security of strength alignment and balance. There is no compromise with quality.

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All adjustments are designed for utmost convenience and operators naturally select the SEMCO Press Brake when they have a choice. You will wonder how SEMCO provides so much for so little cost.

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SERVICE MACHINE CO. INC.

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CIRCLE INFORM-A-GRAM KEY NO. 20

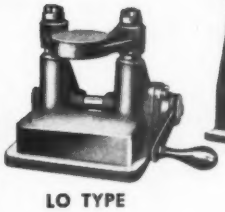
Got a deadline to meet?

If you had a ***Swartz Standard Fixture***
in your shop your tooling problem
would be solved.

Swartz Fixtures *are usable on a multitude of jobs.*

ALL TYPES OF SHOP PRODUCTION TOOLS

5 LOCK SIZES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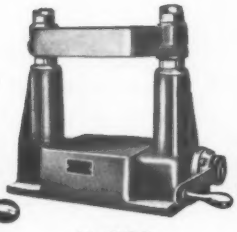
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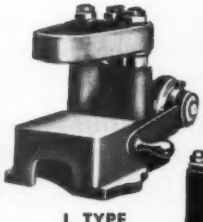
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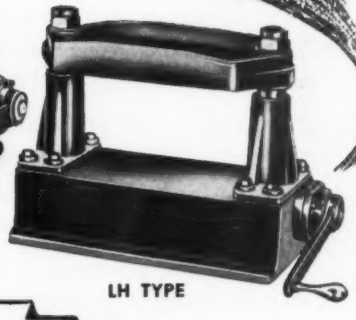
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MAKE USE OF OUR ENGINEERING SERVICE. AN AGENT WILL BE GLAD TO CALL.

There's a Swartz man near you

Swartz

TOOL PRODUCTS

DIVISION OF JEFFERSON CORPORATION

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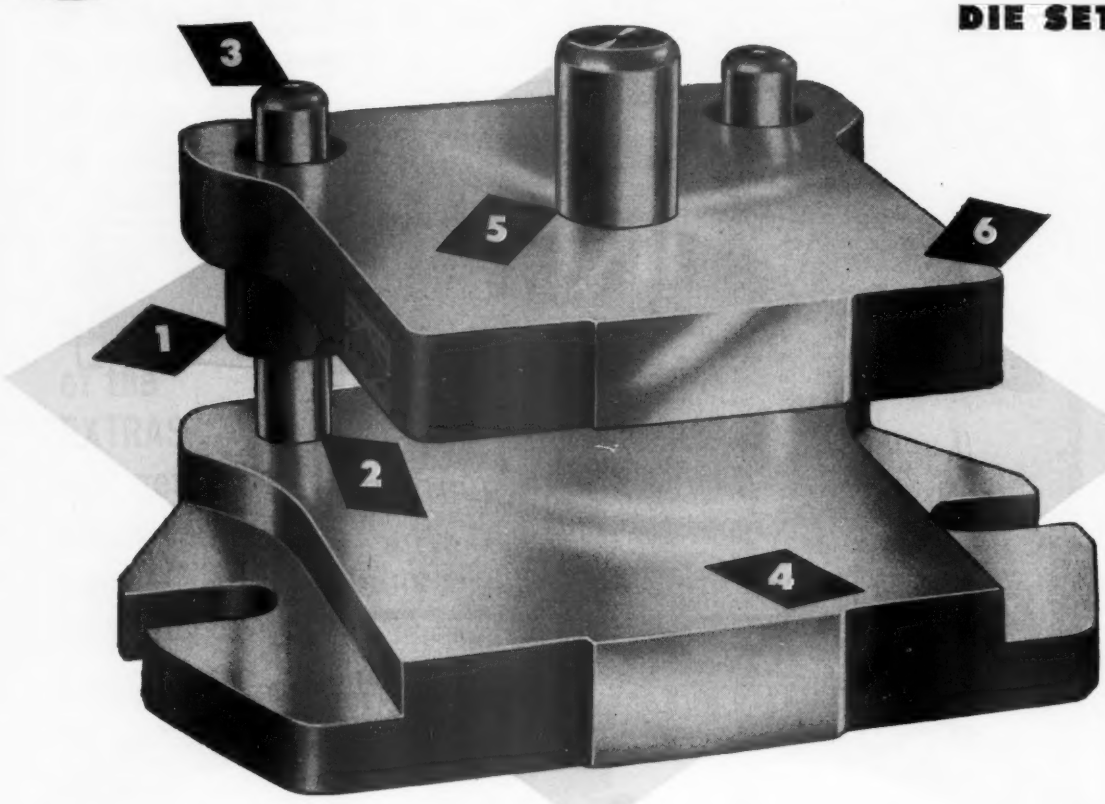
CIRCLE INFORM-A-GRAM KEY NO. 21

6 reasons for buying.. PRODUCTO DIE SETS



1. Bushings have an absolutely uniform inside diameter, resulting in full-bearing and extra long life.

2. New design die set gives added strength and assures accurate location of pin and bushing holes.

3. Accuracy of guide pins and bushings are checked on light guages reading to 50 millionths of an inch.

4. Parallelism and flatness held to close limits by rough machining prior to grinding.

5. Shank, cast as integral part of semi-steel die set, can be inserted or welded on all-steel sets.

6. Surface plates, accurate to within .0001", check flatness of ground surfaces and parallelism of die set.

To make an accurate die, an accurate die set must be used. For this reason, every Producto die set is an instrument of precision.

If planning a new die today, order your die set by the new Producto catalog — selection is easy, delivery is prompt.

THE PRODUCTO MACHINE COMPANY
970 Housatonic Ave., Bridgeport 1, Connecticut

For Precision Die Sets *Fast* Call . . . .

PRODUCTO

ALSO MAKERS OF DIE ACCESSORIES, FEEDING EQUIPMENT, VISES, MACHINERY.

CIRCLE INFORM-A-GRAM KEY NO. 22

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MONDAY
Plant Management Conferences

APRIL 27
TUESDAY
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APRIL 28
WEDNESDAY
Cutting & Grinding Conferences

APRIL 29
THURSDAY
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APRIL 30
FRIDAY
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22nd Annual Meeting of the American Society of Tool Engineers

Your 5 MOST IMPORTANT *Days* IN 1954

APRIL 26-30 INCLUSIVE

INDUSTRIAL EXPOSITION

to be held at

PHILADELPHIA CONVENTION CENTER

- *The* major industrial exposition of production equipment and manufacturing processes.
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ORDER ALL YOUR WORK HOLDING NEEDS FROM ONE SOURCE

Standardized WESPO

TOGGLE CLAMPS - CLAMPS - LEAF JIGS - FIXTURE PARTS

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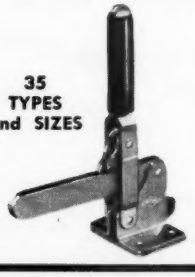
TOGGLE CLAMPS

INCREASE PRODUCTION

WESPO Toggle Clamps are made in types and sizes to meet all work holding needs, light, medium and heavy duty. Hardened bushings and hardened pins eliminate elongated holes and pin shearing.

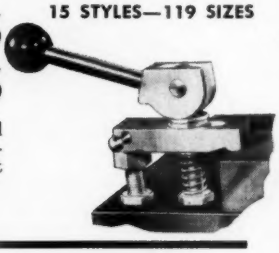
WRITE FOR NEW TEMPLATE CATALOGUE.



35 TYPES and SIZES

FIXTURE CLAMPS and COMPONENTS

15 STYLES—119 SIZES



WESPO now has the largest number of sizes and types in the industry which are being used as standards by a large number of manufacturers. Why not adopt them as your standards?

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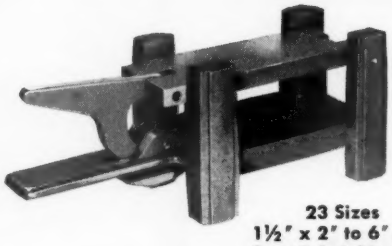
SAVES OVER 50% IN DESIGNING TIME AND TOOLMAKERS COSTS, OVER CUSTOM BUILT JIGS

Ready for immediate use for drilling, tapping and reaming of small parts, by merely nesting part and inserting bushings. Precision-made steel leaf and cam—normalized cast iron body—.002 parallelism held between leaf and machined base. Used for machining in any position—top, bottom or 2 sides. Interchangeable leafs.



23 Sizes
1½″ x 2″ to 6″ x 6″
2 to 3 heights each

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HOLD WORK PIECES WITHOUT MARRING OR MOVING

Swivel screws and Shoes are made in 4 types and 63 sizes to meet work holding needs. Write for Bulletin—prices.

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MADE TO J.I.C. SPECIFICATIONS

Bolts are forged, precision machined, heat treated. Tensile strength 150,000 pounds.
BOLSTER BOLTS—SIZES: dia. to 1¼″, heads square to 3″, hex to 2⅝″.
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NUTS—hardened, threaded to close fit. WASHERS—hardened, ground both sides.
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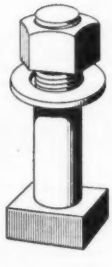

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Test-proven LONGER TOOL LIFE

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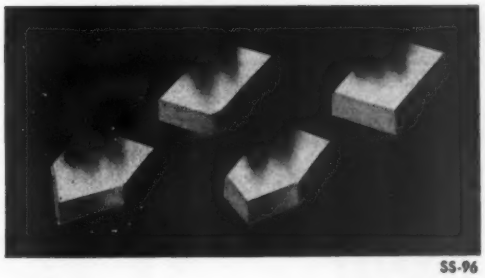
Tests show that SANDVIK COROMANT tungsten carbide tipped tools and blanks have a productive life that compares favorably with that of the best competitive brands. The reasons? — Basic purity of the raw material, intensive research and development plus close, unified control by SANDVIK from the tungsten mine to the finished tool.

COROMANT'S extra production performance has made it famous throughout European metalworking plants. This same cost-cutting advantage is now available to you:

- In a wide variety of tools and blanks—including turning, boring, facing, threading and grooving tools, cutters, drills, reamers, scrapers, copying lathe tools and Swiss-type automatic tools, etc.
- In an unusually wide range of standard tool shapes and angles.
- In all standard grades to suit a wide range of applications and machine tools.
- Grade permanently color-identified on the end of tool shank.



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Make your own test of COROMANT'S money-saving performance. Contact Sandvik for further details.

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UNIVERSAL DRILL BUSHINGS

INSURE PERFECT ALIGNMENT AND LONG LIFE OF PRODUCTION TOOLS

KNURLED HEADS PROVIDE GOOD GRIP
SUPERFINISH BORES REDUCE TOOL WEAR
100% CONCENTRICITY AND HARDNESS TESTS INSURE ACCURACY
BLENDED RADIUS HELPS PREVENT TOOL HANG-UP

Universal Drill Bushings are available in a complete range of standard sizes and lengths. Special sizes made to order. Write to Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis.; or the home office.

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UNIVERSAL ENGINEERING COMPANY
FRANKENMUTH 8
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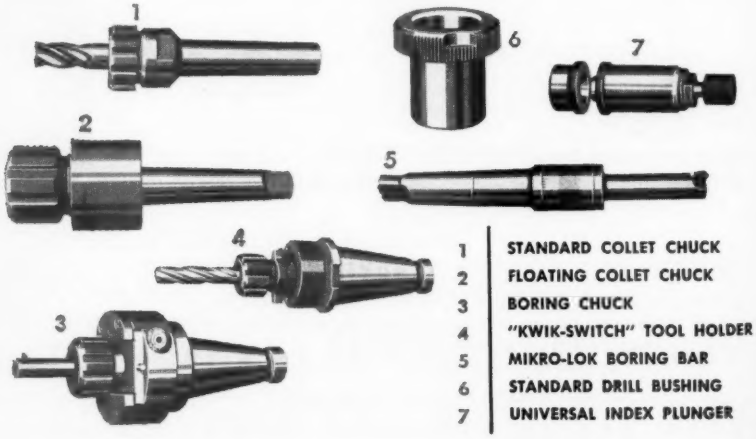

1 STANDARD COLLET CHUCK
2 FLOATING COLLET CHUCK
3 BORING CHUCK
4 "KWIK-SWITCH" TOOL HOLDER
5 MIKRO-LOK BORING BAR
6 STANDARD DRILL BUSHING
7 UNIVERSAL INDEX PLUNGER

CIRCLE INFORM-A-GRAM KEY NO. 26

CADDY P-2®
PLUNGER TOGGLE CLAMP

3000 pound
horizontal clamping pressure

VERTICAL TYPE
CADDY
TOGGLE CLAMPS

1000 TO 2000 LBS. CLAMPING PRESSURE

1. **EXTRA LARGE PIVOT PINS.**
2. **ALL WELDED CONSTRUCTION—** will not come apart even after pins become excessively worn.
3. **HEAVY STEEL FRAME—** will not spring or bend under maximum load.
4. **2" STROKE—ALL BRONZE PLUNGER— RESISTS WELDING SPATTER—** drilled and tapped for set screw.

FOR COMPLETE CADDY TOGGLE CLAMP INFORMATION REQUEST CATALOG-TC-7

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2070 EAST 61st PLACE
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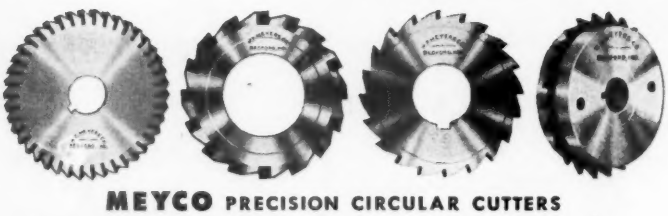
CIRCLE INFORM-A-GRAM KEY NO. 27

DOUBLE BARRELLED SAVINGS with "Know How"

carbide application MEYCO

MEYCO
CARBIDE INSERTED DRILL JIG BUSHINGS

The most practical bushing ever made for high production and maximum accurate life, at lowest unit cost.



MEYCO PRECISION CIRCULAR CUTTERS

For grooving, slitting, commutator undercutting and other operations to meet the requirements of your own individual applications: Solid carbide or carbide tipped.

MEYCO
CUSTOM CARBIDE TOOLING

Precision made for more production per grind. Meyco production and engineering skill makes the difference. Made to your specifications—inquiries invited for prompt quotation.

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- ☐ Meyco Precision Circular Cutters
- ☐ Meyco Custom Carbide Tooling

NAME_____

COMPANY_____

ADDRESS_____

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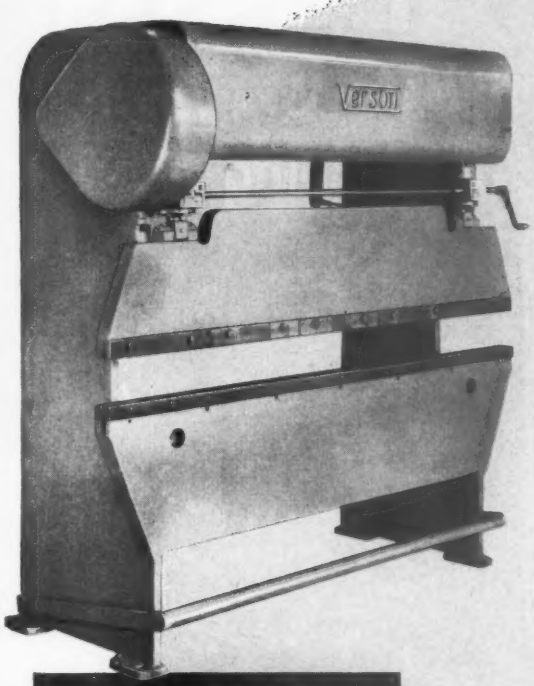
FAMOUS FOR PRECISION TOOLS SINCE 1903
BEDFORD, INDIANA

Our Engineering Department will gladly submit suggestions . . . we make your problem our problem.

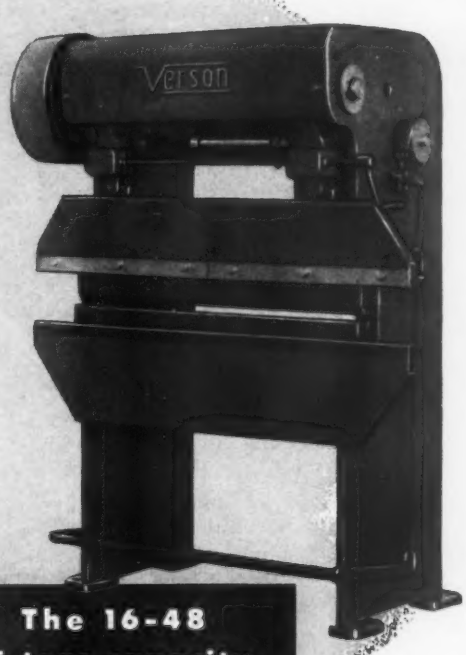
CIRCLE INFORM-A-GRAM KEY NO. 28

Now, for the first time...

Standard Verson Press Brakes Available from Stock!



The 1062
25 tons capacity
(16 ga. x 78")
$2,190.00 as shown



The 16-48
15 tons capacity
(16 ga. x 48")
$1,455.00 as shown

Standard Dies Also Available

Standard 90° "V" dies for these press brakes are also available from stock. 78" long set for the 1062 is priced at $124.00. 48" long set for use in the 1062 or 16-48 is priced at $93.00. (Prices are for dies to handle 16 ga.).

To meet the demand for quality press brakes at modest cost and available for prompt delivery, Verson now offers two standard models *from stock*. For the small shop, it means big press standards of design and construction at prices that will fit almost any budget. For the larger shop, it means an economical answer to handling the smaller jobs without tying up big expensive machines.

Important, too, is the fact that you can order these machines as easily as buying an automobile. There is no involved proposal . . . no long delay awaiting delivery. These standard machines are offered at a standard price and shipped from stock.

Your Verson dealer can give you further information or write direct.

A Verson Press for every job from 60 tons up.

Verson

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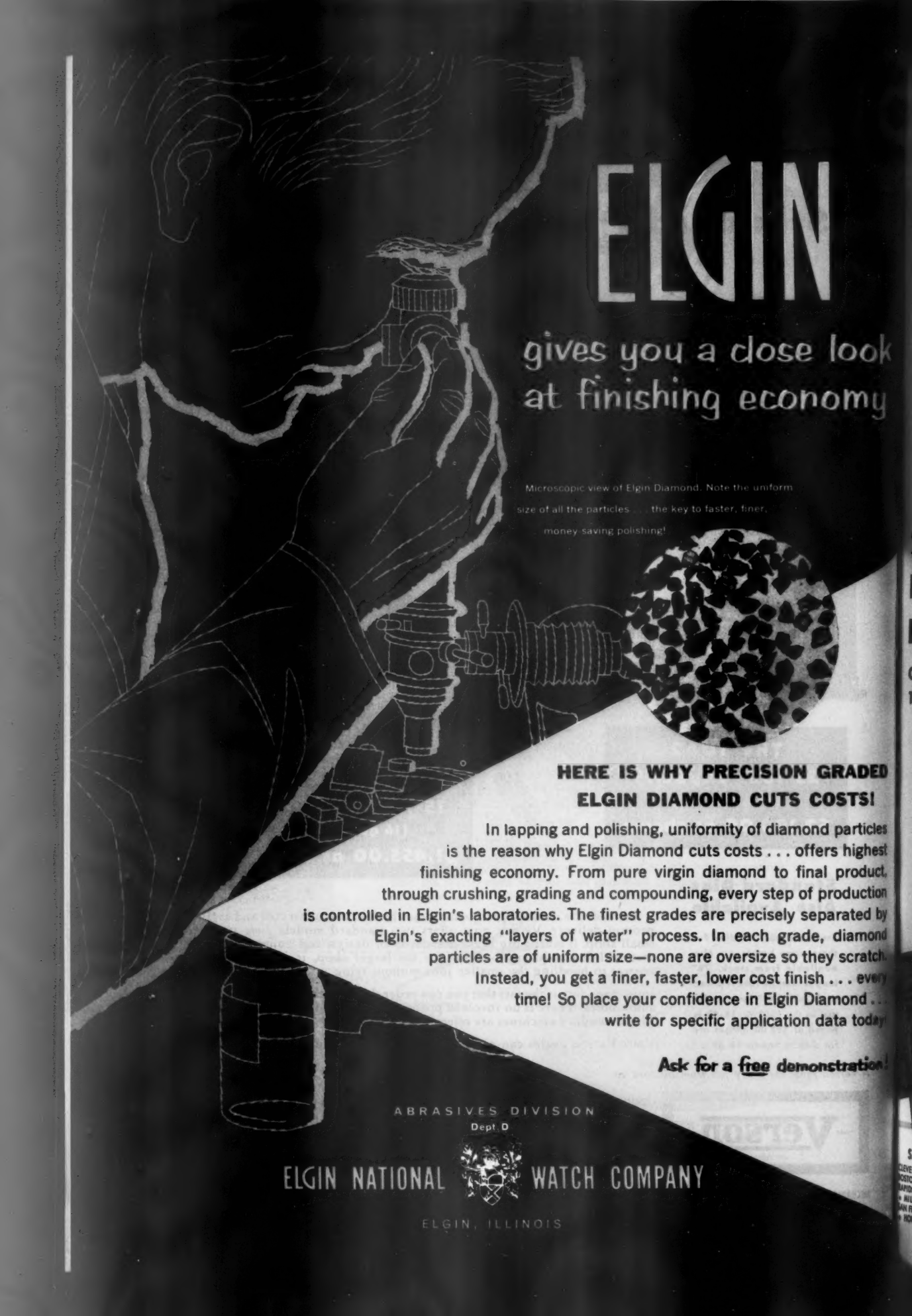
CIRCLE INFORM-A-GRAM KEY NO. 29


ELGIN
gives you a close look at finishing economy
Microscopic view of Elgin Diamond. Note the uniform size of all the particles . . . the key to faster, finer, money saving polishing!
HERE IS WHY PRECISION GRADED ELGIN DIAMOND CUTS COSTS!
In lapping and polishing, uniformity of diamond particles is the reason why Elgin Diamond cuts costs . . . offers highest finishing economy. From pure virgin diamond to final product, through crushing, grading and compounding, every step of production is controlled in Elgin's laboratories. The finest grades are precisely separated by Elgin's exacting "layers of water" process. In each grade, diamond particles are of uniform size—none are oversize so they scratch. Instead, you get a finer, faster, lower cost finish . . . every time! So place your confidence in Elgin Diamond . . . write for specific application data today!
Ask for a free demonstration!
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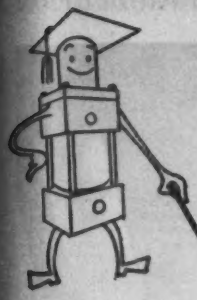
Dept. D
ELGIN NATIONAL WATCH COMPANY
ELGIN, ILLINOIS

Miller

FLUID PRESSURE BOOSTERS

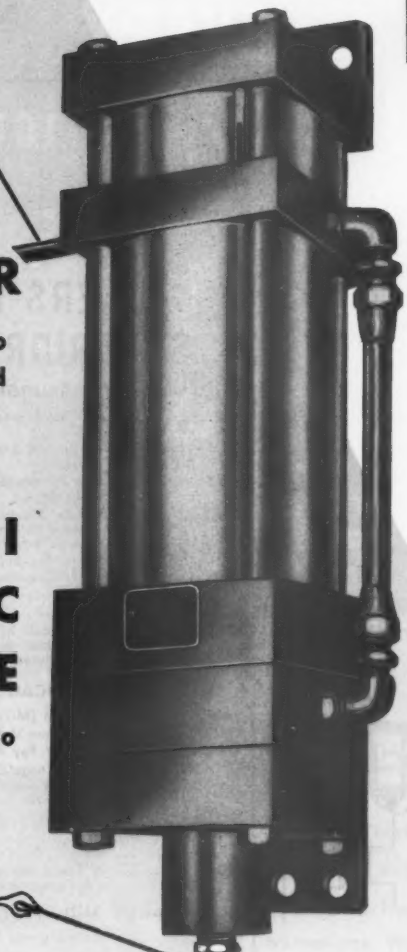


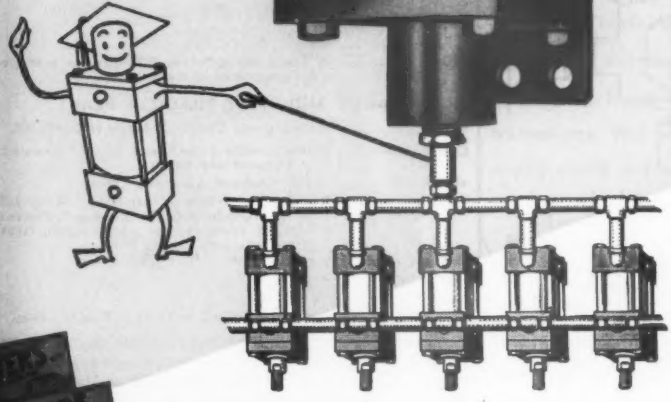
BOOST 80 PSI AIR

Input Range: 40 to 3000 psi Air or Fluid

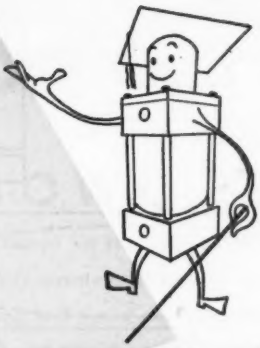
TO 2000 PSI HYDRAULIC PRESSURE

Output Range: 200 to 10,000 psi Fluid





- Save space, weight and investment cost by replacing pump installations in many applications
- Less costly to install, operate and maintain
- **Hold pressure indefinitely** without the motion and heat generation of ordinary pump circuits
- Provide—at point of cylinder thrust—more efficient power with less weight in less space than direct driven air cylinders
- Save up to 95% of air consumed by direct driven air cylinders
- Operate at speeds of 30 to 450 strokes per minute



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and similar applications

FULL DETAILS IN MILLER BULLETIN B-200 SENT FREE ON REQUEST
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MILLER MOTOR COMPANY

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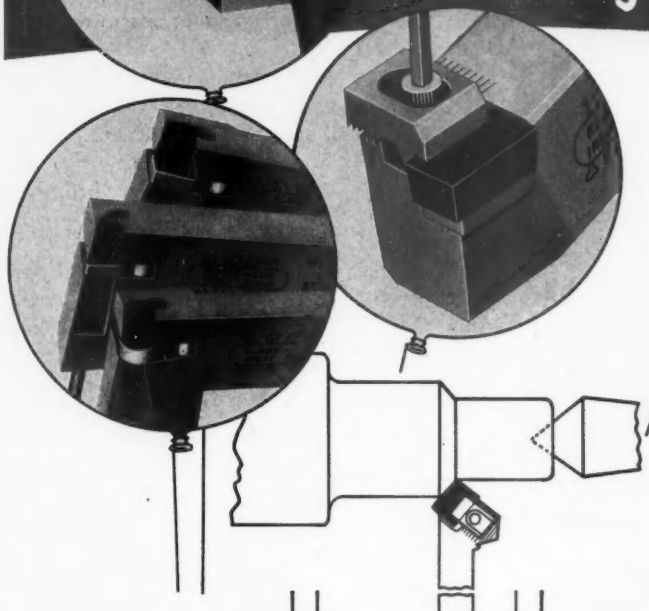
AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS COUNTERBALANCE CYLINDERS

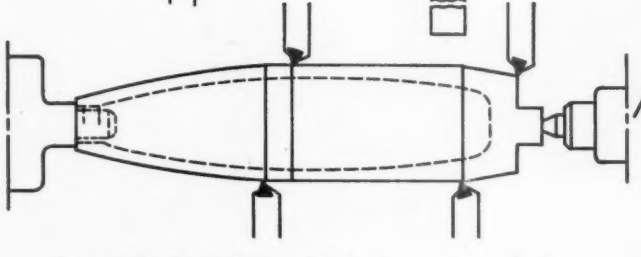
Talide Tipped Tools for EVERY Cutting Operation



USERS REPORT SUPERIOR RESULTS

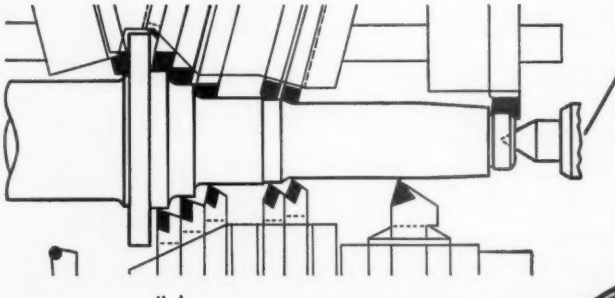
LARGE PITTSBURGH ROLL FOUNDRY

PART	SAE 52100 forged chrome steel mill roll 28" O.D.
OPERATION	Rough turn and finish machine roll necks and barrel.
MACHINE	48" x 15' Mackintosh-Hemphill Lathe, 50 H.P. motor drive.
TOOL	H-Style Klamp-Lok Toolholder with horizontal clamped Talide insert—Grade S-88 for roughing —Grade S-92 for finishing.
DEPTH OF CUT	¼" for roughing cuts. ⅛" for finishing cuts.
FEED	.050
S.F.M.	125 to 210
RESULTS	Talide tools held cutting edge 40% longer per grind than previous grade used — even at temperatures of 1700° F!



LARGE CHICAGO SHELL PLANT

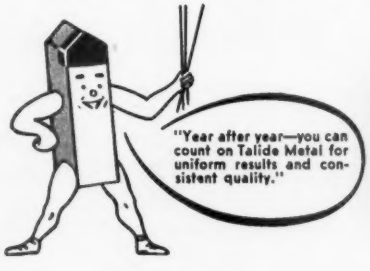
PART	105 M/M (M-1) H.E. Shell.
OPERATION	Rough turn shell body, 1050 Steel Forging.
MACHINE	12" x 21" Fay Automatic Lathe.
TOOLS	TB-16 Triangular Talide Inserts with 3/32" radius vertically clamped in Klamp-Lok Toolholder Grade S-92.
DEPTH OF CUT	⅜"
FEED	.035
S.F.M.	325
RESULTS	45 Shells per grind or 25% increase over previous average of 35 shells.



LARGE MID-WEST TRACTOR PLANT

PART	Shaft Steering Clutch, SAE 8654-H Brinell 370.
OPERATION	Rough Straddle Face Flange, turn all diameters, form undercut and base.
MACHINE	16 x 60 Sunstrand Automatic Lathe.
TOOLS	8 Talide-tipped facing, chamfering, radius and form tools Grade S-88. 7 Klamp-Lok Toolholders with round, triangular and parallelogram Talide inserts Grade S-88.
DEPTH OF CUT	9/32" to 7/16"
FEED	.022
S.F.M.	156
RESULTS	Production up 20% — Scrap and rejects down.

Complete stocks of standard Talide Tools and Tips are immediately available from our warehouses located in Newark, Youngstown, Detroit, Chicago and Los Angeles. Write for General Catalog No. 54-G, Metal Carbides Corporation, Youngstown 7, Ohio.



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YOUNGSTOWN 7, OHIO

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HEAVY METAL · CERMETS · HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

CIRCLE INFORM-A-GRAM KEY NO. 32

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a New addition to our popular line of

SELECTIVE FEEDING DEVICES

NOW! A FEEDING UNIT FOR ALMOST ANY SPECIFIC APPLICATION!

Also EXTENDED ENGINEERING SERVICE—

ENABLING US TO DO THE COMPLETE TOOLING FOR YOUR INDIVIDUAL FEEDING OPERATIONS

NOW!

Write Us—Give Details and learn how our trained engineers can supply the answer to your feeding requirements.

DPS BOWL-FEEDER

A proved method based on the VIBRATORY PRINCIPLE. Provides fully automatic, oriented, single line feeding to Grinding, Packaging, Inspecting and many other automatic machines and operations. Will scientifically feed light, fragile parts that normally could not withstand tumbling.

DPS BARREL-FEEDER

For years our popular unit, successfully used in thousands of plants to help speed production and reduce costs. They were designed with the idea of simplicity in operation and maximum feeding, handling a wide variety of parts. Designed for constant operation.

DETROIT POWER SCREWDRIVER CO.

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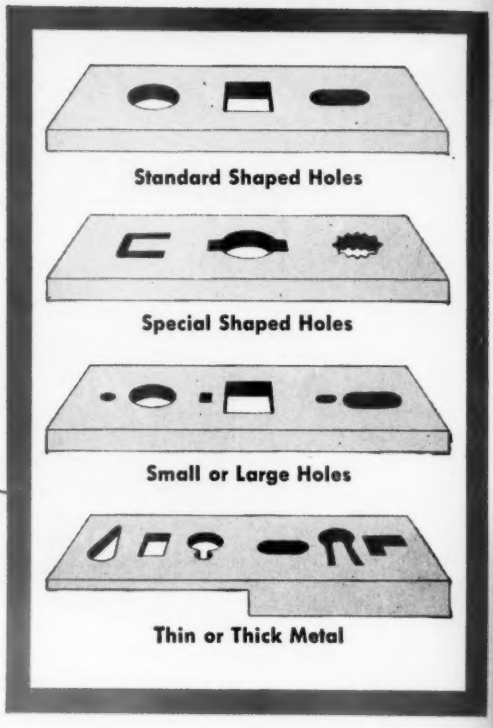
CIRCLE INFORM-A-GRAM KEY NO. 33

WHEN R-B Punches Are Used



What are your piercing or forming requirements —standard or unusual shapes—small or large holes—steel or special alloys—thin or thick metals? There is either an R-B punch in standard shapes and sizes or R-B will manufacture special punches, die buttons and retainers to your specifications that will provide more efficient piercing operations.

Many hole-making applications, formerly requiring drilling or some other costly means, can now be done with R-B interchangeable punches. If you have thought your piercing jobs too tough for interchangeable punches, it will pay you to investigate the wide application potential of R-B standardized equipment.

R-B Engineering Service Is Available for Your Tough Piercing Problems.

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ALLIED PRODUCTS CORPORATION
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STANDARD CAP SCREWS
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SHEET METAL DIES MADE OF FERROUS ALLOYS, ZINC ALLOYS OR PLASTICS

CIRCLE INFORM-A-GRAM KEY NO. 34

HANDY PRODUCTS'

Jiffy Cabinet

the best way to put small items in their place!

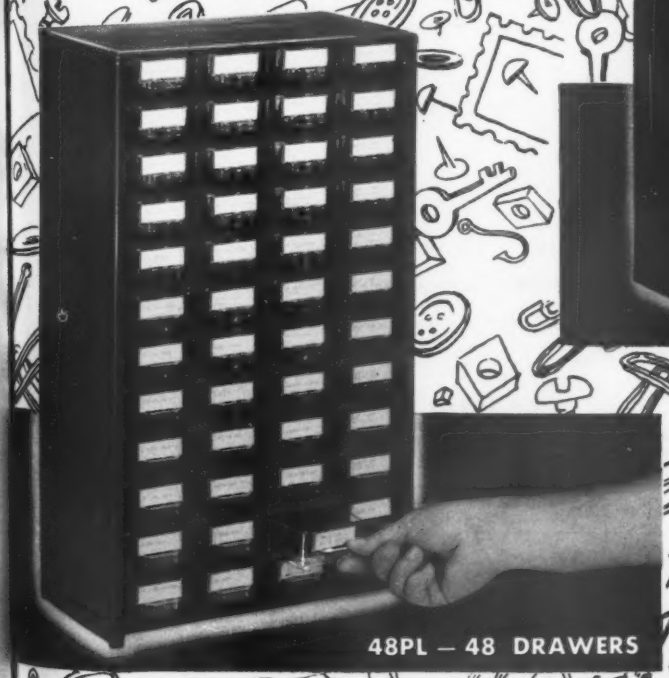
IN THE PLANT, IN THE OFFICE, IN THE HOME . . .

there are dozens of small parts that require easy, convenient storage. The slickest, handiest answer to this problem is the JIFFY Cabinet. Check these outstanding features!

16PL — 16 DRAWERS

24PL — 24 DRAWERS

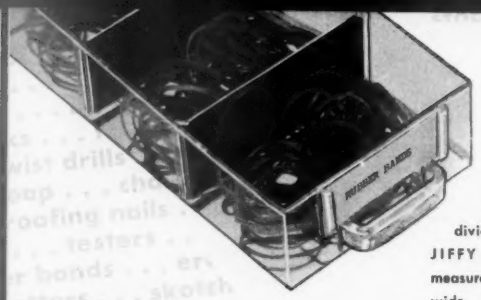
32PL — 32 DRAWERS



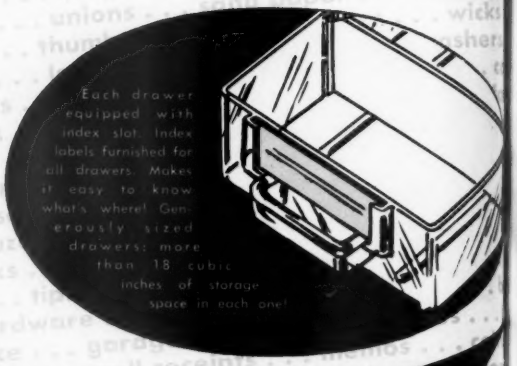
48PL — 48 DRAWERS

* Quick, convenient storage for dozens of small items. A necessity in homes, offices, shops.
* Four sales-keyed color combinations:
  Cocoa Brown frame with tan styrene drawers
  Black frames with gray styrene drawers
  Red frame with crystal styrene drawers
  Gray frame with crystal styrene drawers

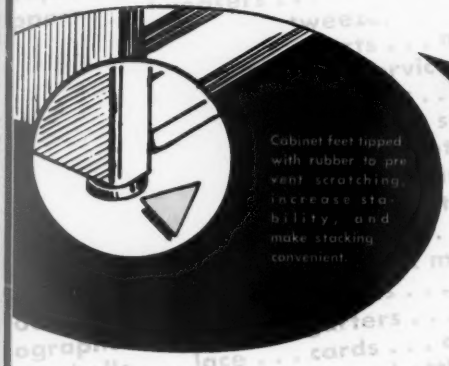
SEE REVERSE SIDE→



Inside of drawer easily divided into three compartments with sturdy dividers. Full set of sturdy dividers supplied with every JIFFY cabinet! Drawers measure 5¾" long, 2⅞" wide, 1¼" deep.



Each drawer equipped with index slot. Index labels furnished for all drawers. Makes it easy to know what's where! Generously sized drawers: more than 18 cubic inches of storage space in each one!

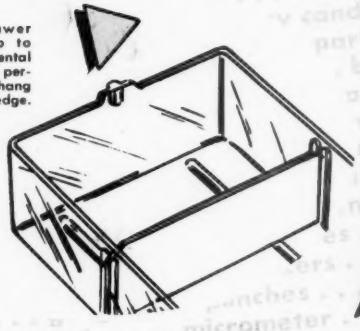


Cabinet feet tipped with rubber to prevent scratching, increase stability, and make stacking convenient.

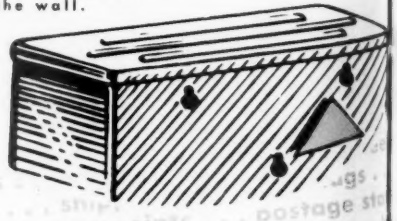
the Jiffy Cabinet

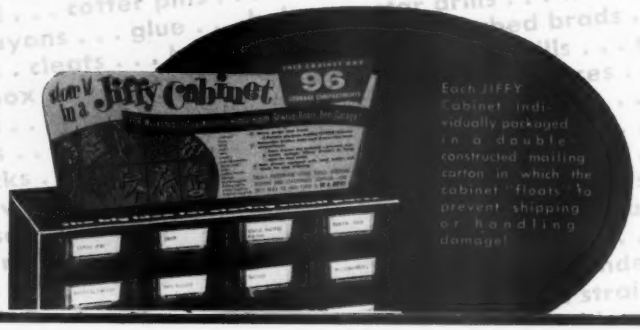
is available in four convenient sizes. One of them is sure to be the right one for you.

Each drawer has a stop to prevent accidental spillage and to permit drawer to hang open from divider edge. Ribbed runners on bottom of all drawers permit drawers to slide freely.



Solid one piece back panels keep dust out . . . girder type construction for maximum strength. Back panels have keyhole slots for handy mounting on the wall.





Each JIFFY Cabinet individually packaged in a double constructed mailing carton in which the cabinet "floats" to prevent shipping or handling damage!

Please send immediately the quantity, size and color JIFFY units as listed:

☐ 48 Drw. @ $19.95* ☐ 32 Drw. @ $12.95* ☐ 24 Drw. @ $9.95* ☐ 16 Drw. @ $7.95*

☐ Red w/clear drwrs. ☐ Brown w/tan drwrs.

☐ Black w/gray drwrs. ☐ Gray w/clear drwrs.

(NOTE: If color is not specified, we will ship Red Cabinet w/clear drwrs.)

HANDY PRODUCTS

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NAME .....

STREET .....

CITY ..... ZONE ..... STATE .....

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☐ Check or Money Order Enclosed.

No. C.O.D.'s, Please.

*Ohio Customers Add 3% Sales Tax.

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the revolutionary new coolant system that . . .

keeps cutting tool and work at room temperatures!

lo-jet acro's *proven results in America's leading industries are making production history, from coast to coast!*

* Controlled compressed air operation for all types of metal cutting with special ACRO-COOLANT soluble solution.

Pictured here is the 8½" outlet centrifugal equalizer distributor with 8 copper tube spray feed. This assembly serves 8 cutting operations.

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- cuts tool breakage loss
- saves money
- speeds production
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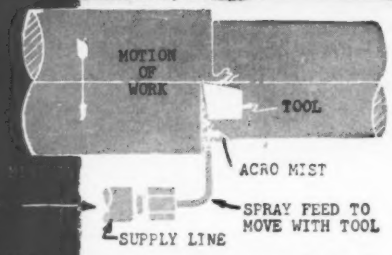
there is a lo-jet acro *system for every purpose and every machine.*



write now for more information at no obligation.

Our engineering staff will cooperate free of charge.

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Gentlemen: Please send me full information about lo-jet acro's coolant system.

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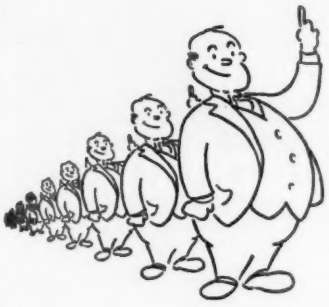
CIRCLE INFORM-A-GRAM KEY NO. 37

Sheldon 12" Lathe

TRACER CONTROLLED MACHINING APPLIED TO SMALL LATHES

Cincinnati 12" Tray Top Lathe



Mr. Duplicator

MR. DUPLICATOR SAYS—"Walker, during my visits to many manufacturing plants I do not see Duplicators on small lathes. Tracer controlled machining should be able to produce small parts as well as large ones because the same principle is involved.'

WALKER SAYS—"We do have Tracer Controlled Machining applied to turret lathes and engine lathes of the smaller sizes. These machines usually have the high speeds and are versatile in their designs so that the small parts as well as large ones can be made, duplicating the forms, steps and radii from a templet. As you know, our duplicators are unique in design in that all controls are in front along with the templet. This short-coupled design gives greater accuracy and a feeling of security to the operator that is found only in WALKER'S Universal Step Turning design."

WALKER DUPLICATORS—just simple hydraulics applied to the lathes in your shops. Please note that we have no electronic devises, clutches, periscopes, mirrors or mechanical brains to confuse you.

WALKER DUPLICATORS are turning rolls in steel mills, reworking treads on railroad car wheel axle assemblies and turning shafts with lengths up to 20 feet, as well as shorter ones. We are milling uneven surfaces—have applications on grinders and planers. There are very few jobs that can't be done to advantage with tracer controlled machining.

We can furnish a thorough and understandable solution to your duplicating problems. Send us a print of the part to be made, along with make and size of machine to be used, and we will give you recommendations and firm quotation.

REPRESENTATIVES IN PRINCIPAL AREAS

Walker HYDRAULIC DUPLICATOR CO.

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Pioneer Designers and Builders of Precision Duplicating Equipment

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J & L DIE HEADS OFFER *everything!*

- ✔ LOW INITIAL COST
- ✔ EASE OF OPERATION
- ✔ CONTROLLED RESHARPENING
- ✔ CLASS III GUARANTEED
- ✔ USE OF CARBIDE TIPPED CHASERS WHERE APPLICABLE

FOR BROWN & SHARPE AUTOMATICS and SMALL TURRET LATHES
Capacities from #0 to 1¼"

RADIAL CHASER TYPE
Capacities from #8 to 4¼"

TANGENT CHASER TYPES
Stationary and Revolving
Capacities from #4 to 2"

P.S. Only J & L Die Heads and Chasers give you ALL these features. Write to Dept. 710 for illustrated catalogs and complete information.

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Machine Tool Craftsmen Since 1835

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CIRCLE INFORM-A-GRAM KEY NO. 39

A MILE OR A SLICE
of tool steel for you
IS IMPORTANT TO MILNE

Milne's favorite orders come in three sizes . . . small, medium and large. Across the continent, Milne has 40 saws cutting tool steel to your order, whether it's in pounds or tons.

And wherever you are, a Milne man is near you. There are 38 Milne tool steel specialists strategically placed to help you with tool steel problems and expedite your order.

Big or little, your order gets the maximum in Milne service.

ORDER
AMCOH Hollow die - Annealed - Spray Painted PINK for identification
1 Pc. 6" OD x 3" ID x 2" Long - 14 lbs.
ORDERED: 11/10/53 10 A.M.
SHIPPED: 11/10/53 2:45 P.M.
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Wide range of sizes and grades in WATER HARDENING—NON-DEFORMING—SHOCK-RESISTING—HOT WORK AND HIGH SPEED TOOL STEELS

All full length Kolorkoted for permanent identification

Write or call for Milne's Tool Steel Selector.

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Established 1887
745 WASHINGTON ST., NEW YORK 14, N.Y.
America's Leading Tool Steel Specialists
Complete Line Of Tool Steels—Hollow and Solid

CIRCLE INFORM-A-GRAM KEY NO. 40

machine tools for rent

The further we get into 1954 the more evident it becomes that the control and reduction of manufacturing costs constitute manufacturing management's major objective.

Manufacturing management's co-partner, sales management, is faced, admittedly, with formidable problems in its job of moving end products into the hands of the customer. With orders no longer showering in over the transom, sales management is facing up to the toughest competition of many years.

There is no question but that enterprising, aggressive, and hard-hitting sales effort can overcome the hurdles posed by a buyers' market; it is the only way and it is the American way; it has worked and it will work again.

Sales management can not, however, carry the ball alone. It will have to be backstopped by manufacturing management's ability to execute a triple play, i. e., (1) to reduce manufacturing costs so that (2) selling prices can be lowered to meet or beat competition, and so that (3) the profits essential to the survival of the enterprise may be sustained.

Obviously, these objectives can not be attained with obsolete and inefficient machine tools which are costly to operate, costly to maintain, and which are inherently incapable of meeting today's productivity demands.

These problems, in the aggregate, are of such magnitude that the announcement by Kearney & Trecker President Francis J. Trecker of a machine tool leasing program is of considerable import.

Although the detailed workings of the Kearney & Trecker "Tool-Lease" program involve three different plans. the end result is that here is a machine tool builder offering his entire line of standard machine tools on a rental basis. Further, the three plans, each basically a 7-year lease agreement, provide options whereby the customer may terminate the lease or purchase the machines at a fair price at the end of one, two, or three years.

The ramifications of the plan are many and varied.

Even though industry is putting modernization and replacement of equipment foremost in its long term planning, long term planning does not mean that the exigencies of 1954 will be met in 1954.

The Kearney & Trecker machine tool rental plan can act to speed up or shorten long term planning by offering a manufacturer greater choice in the trying, testing, and comparing of production equipment than exists when outright purchase is the only alternative. During the rental or trial period the user can observe the machine in actual operation and pass judgment on its performance before having to decide definitely whether to purcahse.

In disclosing the plan, Mr. Trecker stressed that the Tool-Lease program would assure a manufacturer the services of a machine as long as it was needed, without being committed for the total life of the machine and thereby avoiding the risk of high or unanticipated obsolescence.

By the same token, the plan can operate to allow a manufacturer to maintain high standards of productive efficiency and capacity without incurring prohibitive costs, and to permit a considerably wider and more flexible choice of production methods with which to meet changing manufacturing conditions.

This means that the plan can be employed to a manufacturer's advantage when he seeks to diversify or explore a new market. The launching of a new product may necessitate the acquisition of more or different machine tools than are at hand. The rental plan would not only obviate the capital risk involved in a new venture, but, in many instances, would be the only means whereby the venture would be made; thus aiding and abetting one basic philosophy of free enterprise, i.e., "nothing ventured, nothing gained."

Obviously, this machine tool rental plan is one approach by Kearney & Trecker to meet 1954's competition within their own machine tool field.

Enterprising competition being what it is, it is inconceivable that other machine tool builders will not offer industry equally attractive means whereby production modernization can be effected at an increasing pace.

As these plans are conceived and put into being, the benefits therefrom will expand and multiply to the advantage of machine tool users, of manufacturers who procure components from outside suppliers, and of the ultimate consumer; all in terms of more and better products, produced at lower costs, offered at lower selling prices, and with the fair profit return so necessary to keep free enterprise free.

E. Willard Pennington

Editor

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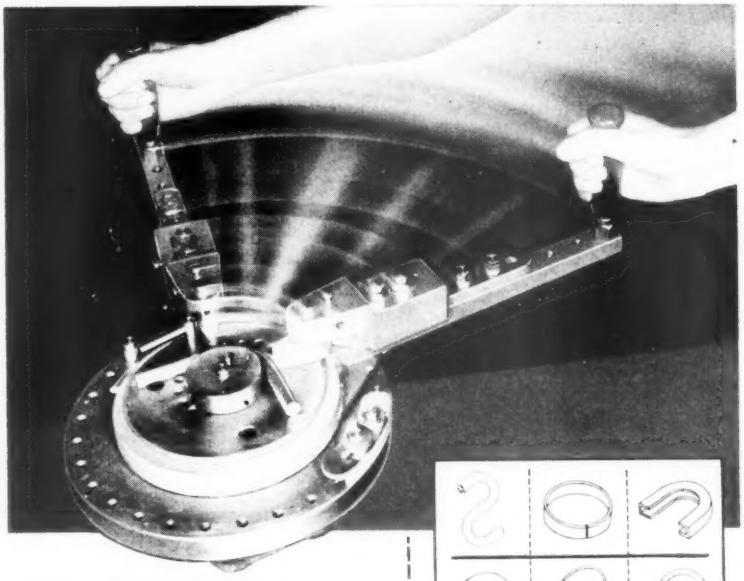

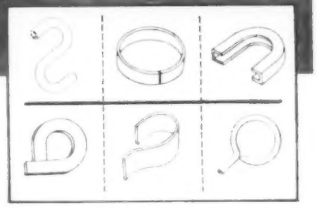

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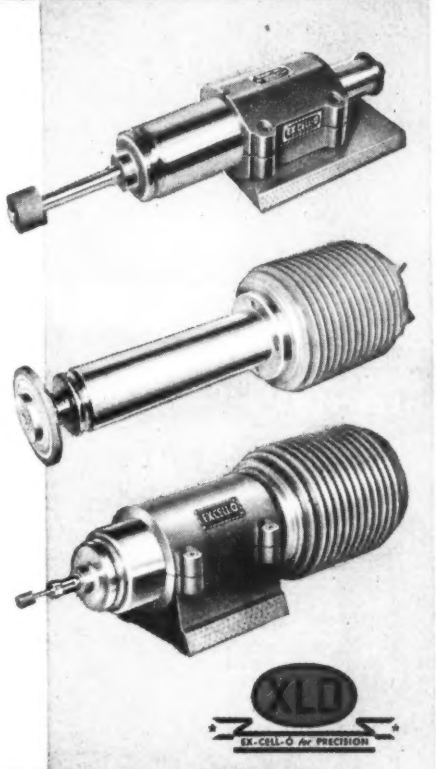

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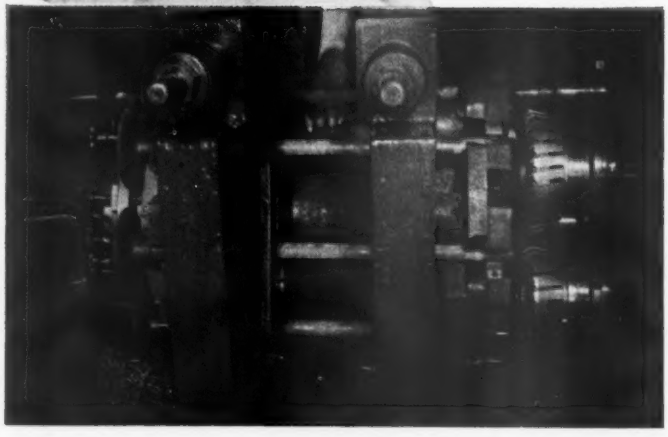

ACTUAL JOB
Large Automobile Plant

Machine.....Davis Thompson Milling Machine
Part.....Rear axle shaft
Operation....Rough and finish mill spline end
Material.....S.A.E. 1038—Brinell Hardness 179-229
Tools.....Wesson 6" and 8" dia. Milling Cutters—fine pitch—inserted blade
Speed.....8"—387 S.F.M.
6"—290 S.F.M.
Feed.....14" per minute
Production...150 pcs. per hour
1500-1700 pcs. per grind
Grade of Carbide....Wessonmetal WM

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Pieces per Grind.....275	Pieces per Grind.....1600
Grinding Hours per year.....10,300	Grinding Hours per year.....2500
5 Machines Running 3 Shifts	3 Machines Running 2 Shifts
Machine Repair per year.....$25,000	Machine Repair per year.....$1200
Tool Cost per Piece.....$.00545*	Tool Cost per Piece.....$.00213*

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CARBIDE TOOL EVALUATION

by H. O. Warnock

Chief Engineer, Research Testing
FIRTH STERLING, INC.
Pittsburgh, Pa.

TOOL EVALUATION is recognized today more than ever before not only as a quality control for the consumer but also a process control for the manufacturer as well. This evolution is demonstrated by General Electric's specification for solid tool bits, D9B5 S-2, more than half of which pertains to a specification for Tool Test Life Evaluation. And forecasts indicate that more and more users of high speed steel and carbide tools will demand, as purchase specifications, Tool Life Test evaluation rather than chemical analysis and physical properties alone.

Carbide Tool Evaluation should be a basic part of research in developing new compositions or carbides. It is also a control factor in improving and maintaining quality of standard carbides. Tool evaluation is the answer to the individual problem of the user because it assures uniform results under specific conditions. Therefore, by using it, we are in a much better position to make available technical data as to grades of carbide and feed and speeds at which a tool may run efficiently. Such knowledge enables us to improve standard grades and know why a slightly different composition will cut better under certain conditions.

Although many variations of testing exist in tool evaluation, only one is universally recognized: "Life Tests of Single Point Tools" (ASA B5.19 published by the American Society of Mechanical Engineers). However, it deals with high speed steel tools only. But the ASME has in committee a proposal for a standard test for Carbide tools which is expected to be released in the not too distant future.

However, for the last twenty-five years Firth Sterling has utilized tool evaluation for carbide tools as well as steel tools as a function of research. A standard for all carbide tool testing has been established and is divided into two groups: Life Tests and Process Tests. Steel tool testing differs from carbide tool testing in that the tool is run to total destruction.

All cutting grades are given life tests in which a flank wear of .030 is considered the terminal point. In carbide life testing it would be unrealistic to expect a .030 wear land each time but every effort should be made to approach .030 within ±.005. Time for a .030 flank wear is then calculated and tabulated on a graph. In this type of test as in ASA B5.19,

Fig. 1. Typical graph recording the results of tests made on three different carbide grades, based on .030" flank wear.

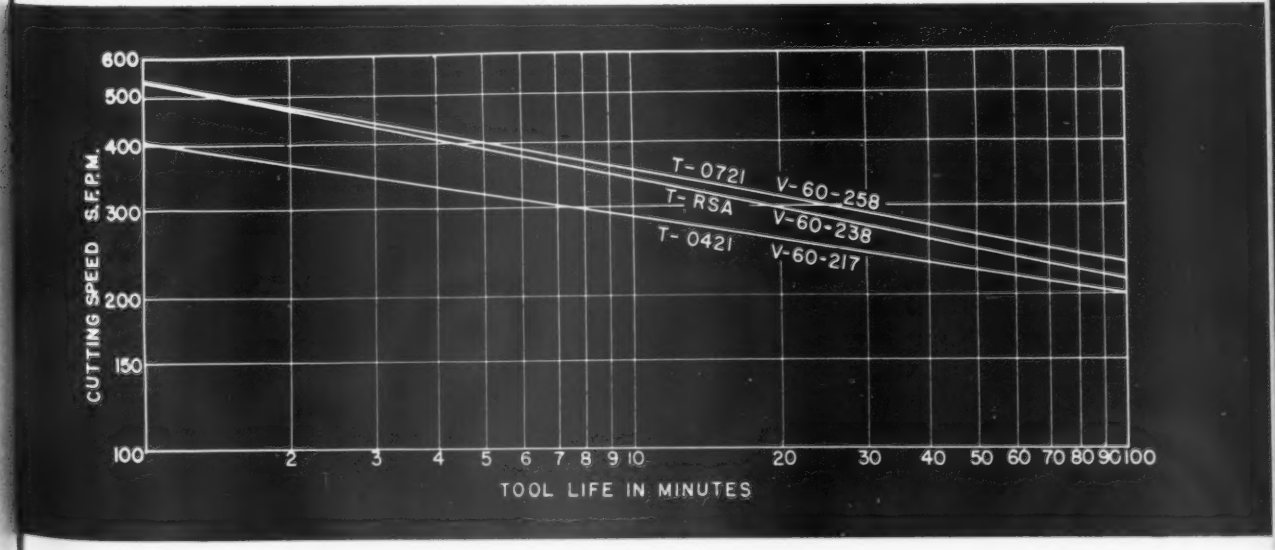


Fig. 2. In process testing the objective is to determine the value of changes in analysis or processing. During the test H.P. readings are taken to determine any increase in drag or wear of the tool. The test evaluates every possible wear measurement of the tool, type of chip, and finish on the log. Process tests are timed to give a wear land of approximately .015". The wear land is the variable with all other conditions fixed.

depth of cut, feed and speed are fixed factors and time is the variable. From time to time retests are run to determine uniformity in quality and composition. The graph's V-60 terminology is universally understood and is used by sales engineers in their consultations with users. Composite graphs showing the relationship between various grades may be furnished. Figure 1 is an example of a typical graph showing results of tests made on three different grades.

In Process Testing, Figure 2, tests are made to determine the value of changes in analysis or processing; therefore, they differ from life tests in that they are timed to give a wear land of approximately .015. Here the wear land is the variable with all other conditions fixed.

Any process testing approaching total destruction is undesirable because the purpose of the test is to evaluate every possible wear measurement of the tool, type of chip, and finish on the log. At various times during the test, readings are taken from an ammeter in H.P. to determine the increased drag or wear of the tool. This type of test reveals maximum information so that, in developing a new grade or checking an old one, the composition or processes can be changed to correct the points of greatest wear.

Even the most minute errors and changes in the test log or grinding of the tools greatly affect tool evaluation results. The test log should be of uniform hardness throughout its length, the most suitable for our purposes being 14" O.D. x 72" long. Where such tests may be discussed with a user, an S.A.E. or A.I.S.I. analysis of the test log is desirable. When the analysis is known and the hardness uniform, off-heat or wash-heat logs may be used. To select a test log for life tests, turnings from the middle of the log and near both ends are sent

Fig. 3. In the chemical laboratory analysis of the test log is made. Turning from the middle and near both ends of the log are used to select a log for life tests. Each log is marked as to hardness and type of steel.

to the Chemical Laboratory where hardness is checked by a "Telebrineller", Figure 3. Hardness tests are made at four equidistant points on the length and three points on the test log's periphery. When found satisfactory, the hardness and type of steel is marked on both ends for proper identification and tabulation of test results.

Although many odd-shaped or special tools must be tested for a specific reason, such tests obviously cannot be used as a standard.

For both life and process testing, the BR clamp-on type of tool holder, Figure 4, measuring 1¼ x 1¼ x 7", is used instead of brazed tools where strains are set up in the carbide tip because of the unequal expansion between carbide and steel. The clamp type holder also introduces economy by eliminating vast quantities of shank steel and silver solder. As further standardization the MC-4 style of tip, measuring 5/16 x 5/8 x 1, was selected as being representative and rugged enough to endure the most severe cuts. Furthermore this type is also used for physical testing and has the added advantage of being readily marked on the end for identification. Easily set up on the grinder for initial grinding in large numbers, the MC-4 style of tip can be reground for further testing by using a fixed angle jig angle and grinding only the front and side relief angles, Figure 5. Thus tools can be reground as fast as they are tested and used again. Surface finish on the carbide tools is checked for uniformity on a Brush Surface Analyzer and a graph is filed under the tool number for permanent record.

The BR type of toolholder lines up the carbide edges to the work at a 15° cutting edge angle. A 3/64th radius, carefully checked for contour on a Jones & Lamson Comparator and inspected for finish under a Bausch & Lomb microscope, is generally used. Tool tips of the MC-4 size 5/16 x 5/8 x 1" are quite easily held on the stage of the toolmaker's microscope to measure all points of wear.

With the tool shank held in a heavy open-side tool post having a fixed base, shims are placed under the tool shank to bring the tool's point to the center line of the test log. After checking this with a dial indicator, the tool shank is clamped in the tool post with the very least amount of overhang possible.

The use of chip-breakers on standard tests is not recommended for two reasons:

1. Separate calculations and grinds would have to be made for each feed and speed.

Fig. 4. Because of conflicting strains that may be set up in brazed tools, the clamp-on style of tool holder and the MC-4 style of tip are used in life and process testing.

2. The slightest error, either in calculation or grinding, would give erratic test results which is what we are striving to eliminate.

The cutting edges of the carbide tools cannot be honed since the human factor would produce irregularities, but they are given a finger nail check as assurance that no chipping or uneven edge has occurred due to grinding.

To conform to general practice the following depth of cut and feeds were selected.

1. .001 in. depth of cut and .0125 feed
2. ⅛ in. depth of cut and .020 feed
3. 3/16 in. depth of cut and .010 feed
4. ¼ in. depth of cut and .030 feed

Surface feed per minute is checked with a Hasler surface indicator.

A Faxfilm impression is made at the completion of a test at a point two inches after the start and another toward the finish (or at any point where breakdown is observed) to check

. . . *Continued on page 169*

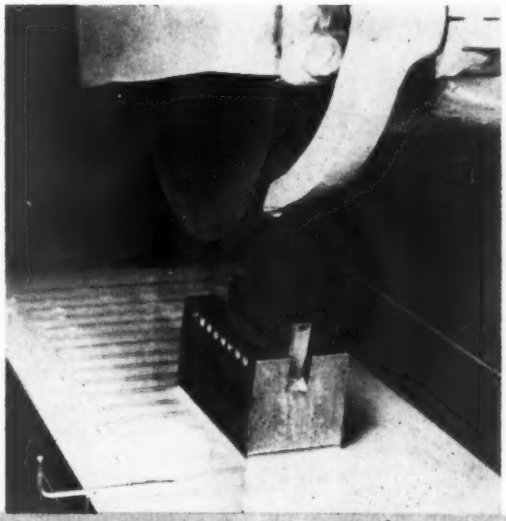


Fig. 5. The MC-4 style of tip is reground for further testing by using a fixed angle jig and grinding only the front and side relief angles.

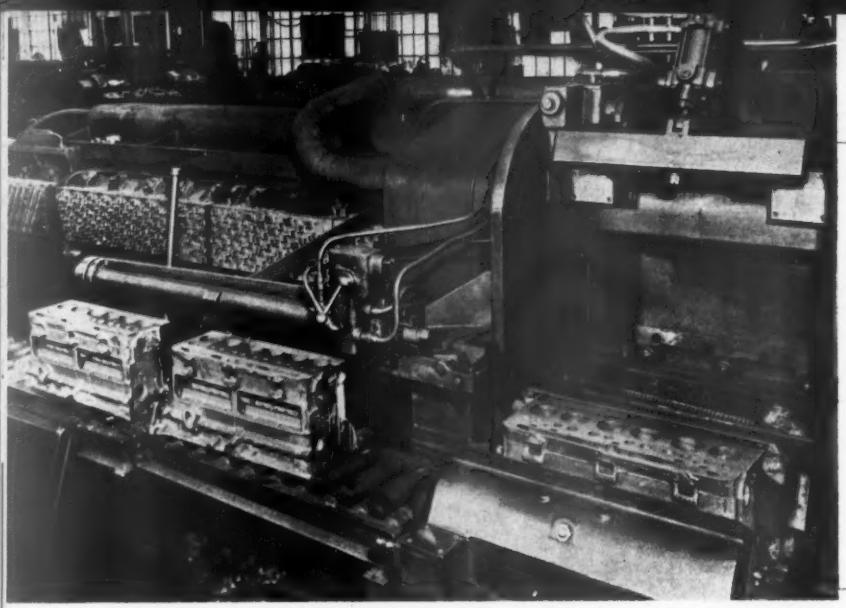


Fig. 1. Broaching the top surface of a cast iron automotive engine block with an inserted carbide tooth surface broach. The head is tipped 90° in the fixture at the right for horizontal broaching.

Carbide Surface Broaches Cut Production Costs

by Albert Forberg
Field Engineer
NATIONAL BROACH & MACHINE CO.
Detroit, Michigan

IF A CAST IRON production part has open-faced flat surfaces or circular contours that require machining, broaching with inserted carbide tooth surface broaches is usually the most inexpensive production process to use. Carbide broaches of conventional-cut and progressive-cut types can be successfully applied on either vertical or horizontal conventional surface broaching machines having feeds varying from 35 to 120 surface feet per minute.

Five main factors contribue to the lower production costs per piece of carbide surface

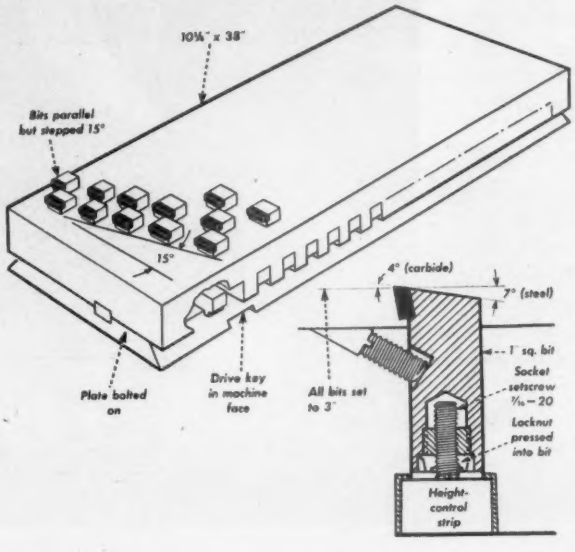


Fig. 2. Details of the roughing section of the broach shown in Figure 1. Note that all tool burs are preset to an over-all length of 3". Height control strips maintain correct cut per tooth for individual teeth.

broaches for machining cast iron parts, as compared to those with solid high-speed-steel surface broaches of conventional design:

1. More pieces per grind. Carbide broaches give up to 20 times the tool life of high-speed-steel broaches.

2. Less downtime. Damaged or worn solid carbide or carbide tipped tool inserts can be quickly removed and replaced with sharp tools.

3. Less grinding time. Individual carbide tool inserts and set screw assemblies need merely to be extended in length to compensate for tool breakdown and then ground in groups to a predetermined height before mounting in the broach body.

4. Less production time. Shorter broach travel is permitted by the carbide broach because of heavier cuts per tooth permissible with carbide tools.

5. Less tool breakage. On scaly cast surfaces, carbide resists scale damage much better than the high-speed steel.

General Considerations

Like all other broaching processes, the successful use of carbide surface broaches depends on three variables: The part, the machine, and the tools.

To be successfully surface broached with carbide tools, a cast iron part must be of a shape and construction that assures maximum part rigidity. Areas on automotive engine cylinder block castings such as main bearing surfaces must have sufficient rigidity to permit the removal of metal by broaching without deflection and subsequent chatter problems.

The broaching machine must have sufficient capacity for the increased load per tooth permissible with carbide tools. Although older models can handle carbide broaches successfully, the machine must be in first-class condition to assure that the broach will travel past the work at a constant rate of speed. This will reduce vibrations that can damage carbide tips and inserts.

The broach body itself must be designed to provide maximum rigidity for individual tools and inserts. And, of course, the work-holding fixture must clamp the part or parts securely to prevent any relative motion between fixture and part during broaching. The clamping means should be designed so that the surface to be broached is not deflected by clamping.

Conventional-Cutting Broaches

Inserted carbide tooth broaches for flat surfaces are usually made up of one or more roughing sections and a finishing section (See Figs. 1, 2, 3, and 4). Teeth in the roughing sections are standard carbide tool bits altered slightly to provide adequate clamping means. These tool bits are mounted in square holes in the broach body. Height control strips are designed in such a manner that all tools can be adjusted to the same over all length in the grinding room and merely inserted in the

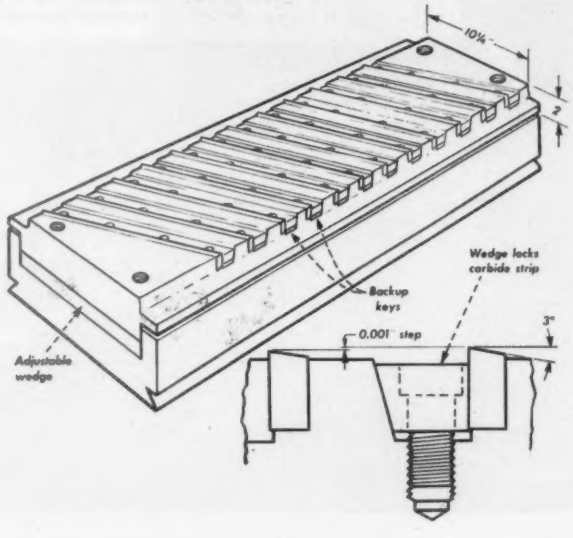


Fig. 3. Details of the finishing section of the broach shown in Figure 1. Note that an adjustable wedge is provided in the broach body for depth adjustment of the entire assembly. Steps in the body provide 0.001" steps between carbide strips.

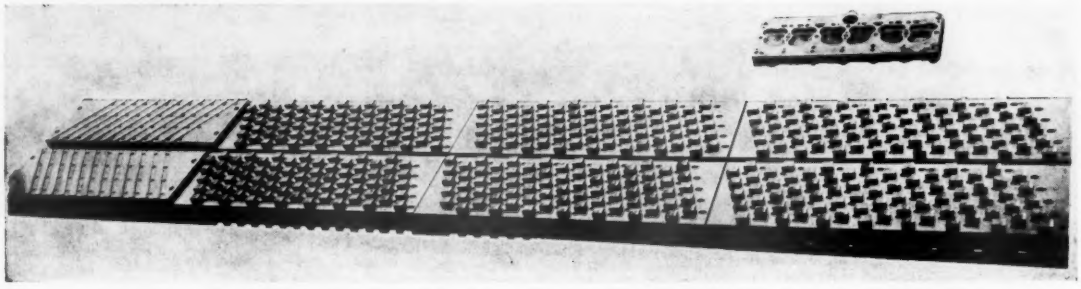


Fig. 4. Two inserted tooth surface broaches, similar to that shown in Figure 1, are mounted alongside one another to simultaneously broach both sides of a cast iron cylinder head on a horizontal surface broaching machine.

square holes in the body, thus providing correct depth setting for each tooth. Individual set screw and lock nut details in each tool bit permit the necessary height adjustments.

Teeth in the finishing section are standard carbide strips locked in place with wedge locks. These strips are set in slots of varying depth in the broach body. An adjustable wedge under the broach body provides over-all depth adjustment for the finishing area.

Progressive-Type Broaches

When semi-circular surfaces or portions of circular surfaces have to be finished on cast iron parts, a carbide surface broach of the progressive type can perform the machining operation. In broaches of this type, the body is merely a long round broach bar with square holes along the bar. These holes are on radial centerlines that follow a helical path down the broach bar. Individual standard carbide-tipped tools are locked in position in the square holes by a set screw arrangement.

The broach shown in Figures 5 and 6, for example, has two rows of inserted carbide tools. One row broaches one-half of the semi-circular bearing cap surface and the other row broaches the other half. The two rows of tools come to a point at the rear of the broach. In a broach of this type, each tool must take a relatively heavy cut. Minimum tool chatter and tool breakage is provided by backing up the tool in its entire length with integral lugs machined in the broach body (See Fig. 6).

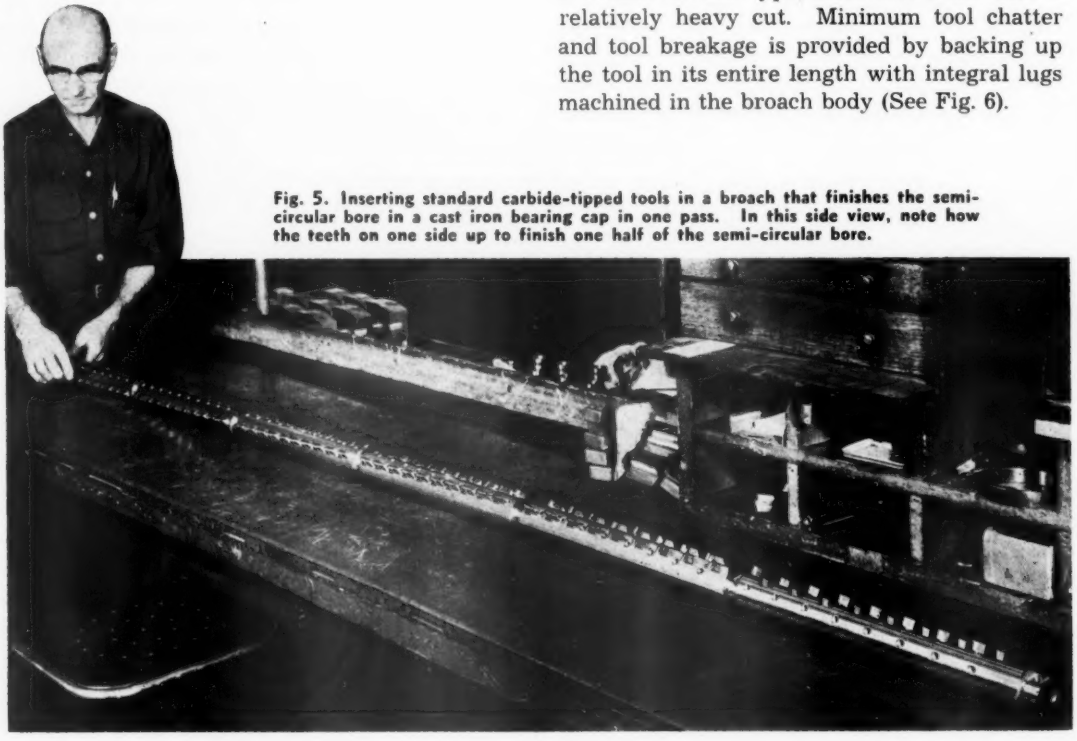


Fig. 5. Inserting standard carbide-tipped tools in a broach that finishes the semi-circular bore in a cast iron bearing cap in one pass. In this side view, note how the teeth on one side up to finish one half of the semi-circular bore.

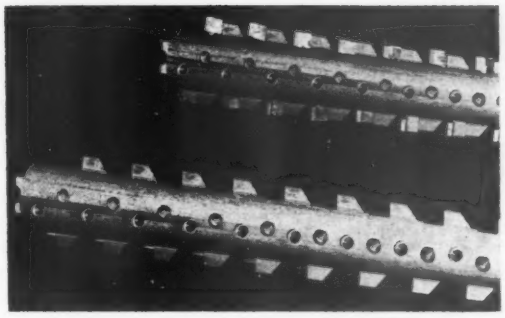


Fig. 6. A close-up view of one section of the broach shown in Figure 5. Tools have been removed from the lower section to show how integral lugs machined on the broach bar back up the tools to prevent deflection due to the relatively heavy cut each tool takes.

Fig. 7. Top view of the broach in Figure 5. This broach is used in conjunction with a carbide broach assembly similar to that shown in Figure 1. Two outside faces, the flat face, and two chamfers as well as the half-bore are simultaneously finished in one pass on a horizontal broaching machine.

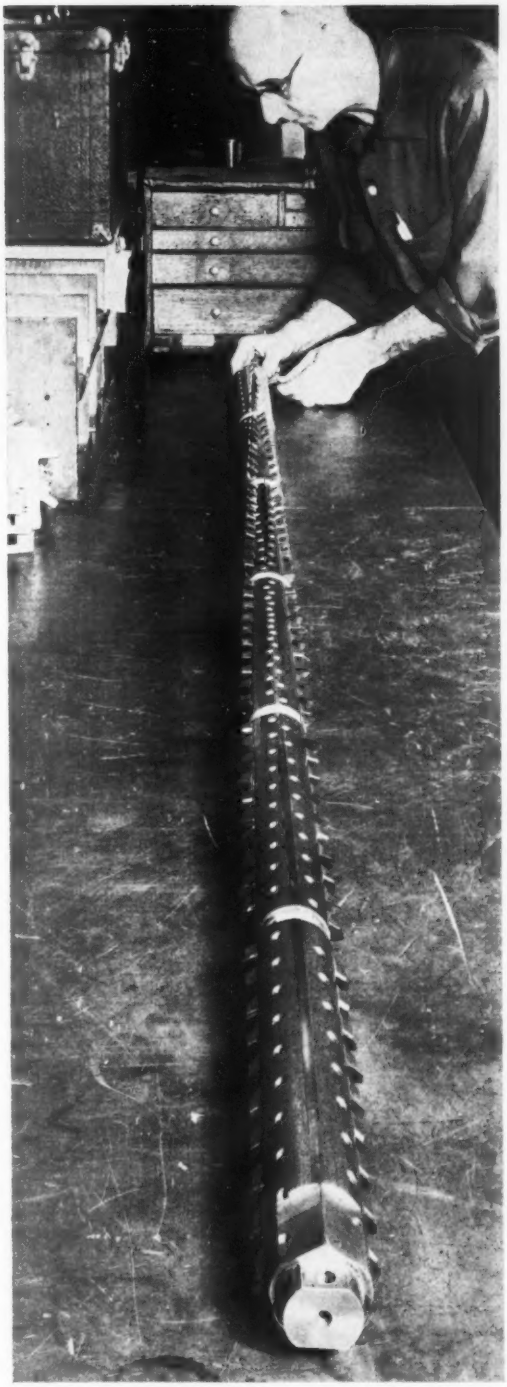
Note, in this broach, that the cut progresses across the surface at full depth of cut to generate the desired form. This same principle frequently can be applied in broaching flat surfaces. Progressive type broaches minimize tool abrasion on scaly surfaces like cast iron.

The selection of conventional-type carbide surface broaches depends largely on the width of the surface to be broached and the stroke of the broaching machine. The progressive type broach would usually be of greater length than a conventional type broach for the same operation. A wide surface may require too long a stroke with a progressive type broach.

Tool Life of Carbide Broaches

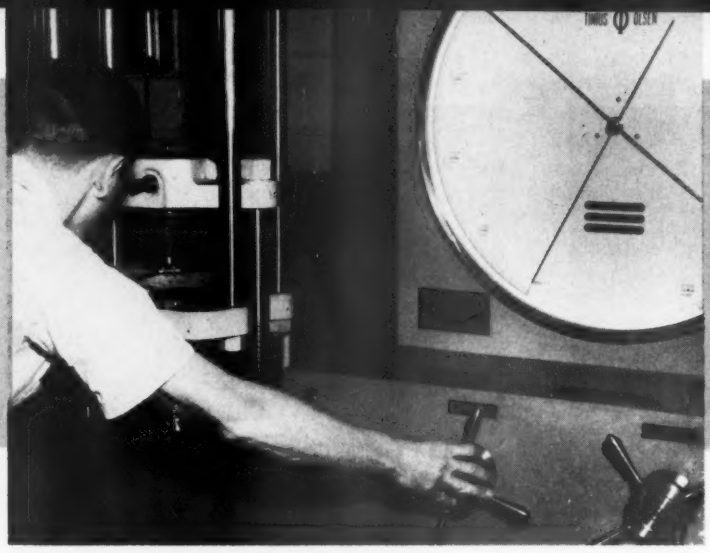
On cast iron parts, carbide broaches have much greater tool life because of the high abrasion resistance of carbides. On a typical surface broaching operation on cast iron cylinder heads, high-speed-steel broaches averaged 1050 pieces per grind and had a life of 10 grinds before recutting and reshimming.

A carbide surface broach on the same operation (Fig. 4) had 198 worn tools—of the 450 in the roughing and finishing sections—replaced with sharpened tools after broaching 31,072 heads. The 15 finishing blades for the top boss surface were replaced after broaching 16,182 heads. The 15 finishing blades for the bottom chamber surface were replaced after broaching 12,265 heads. Total metal removal was 0.0230″ on the boss surface and 0.200″ on the chamber surface. All remaining tools



lasted considerably longer than the 31,072 figure.

Downtime for replacing tools on the carbide broaches was minor compared with the time required to remove a high-speed-steel broach body for sharpening and to install a resharpened body.



Kennametal's quality control system ensures uniform, extended tool performance through the use of high quality raw materials, rigidly controlled manufacturing processes, and adequate inspection of the finished product.

How Quality Can Make or Break Carbide Tools

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A CRITICAL ITEM in every metalworking activity is tool cost control. This embodies many factors, including machine characteristics, grinding of the cutting edge, and the metallurgical condition of the workpiece. A fourth and very important factor in metalworking efficiency is the quality of the tool material used.

The usable life of a cemented carbide tool is dependent on proper application of its basic characteristics. Each Kennametal carbide grade has been specifically tailored for maximum metalworking life on a specific range of jobs. Basic in this concept is the knowledge of the factors which make selective properties possible in the tool. Secondary, but no less important, is the use of manufacturing processes and controls thereof which will produce uniform, consistent quality.

"Quality" is a word of variable connotation, dependent upon the material under discussion. We of Kennametal believe that "quality" inherently includes a consistency factor as well as minimum acceptable utility. To produce quality carbide tools, close control of many variables is a necessity. An excellent product results only when adequate consideration is given to all contributing factors.

Normal tool failure results through one or a combination of these routes: Edge wear, cratering, or minute chipping, and it is possible to minimize each of these tendencies through proper use of raw materials and manufacturing processes.

Each carbide grade is produced by compounding the various metallic carbide powders and cobalt powder in specific proportions. To secure uniformity in a grade, these ingredients are carefully blended after close consideration of their properties, ball milled, and further tested.

The heating cycle used to produce hardened carbide blanks from the original soft powder compacts is a critical part of manufacturing. The heating rate, maximum temperature reached, duration of holding at the maximum temperature, and the furnace atmospheric condition all must be well controlled. The heating rate, maximum temperature, and holding time varies for the different grades.

Kennametal conducts all heating operations under vacuum to prevent gaseous contamination. The vacuum heating cycle was part of the original Kennametal process, and is desirable for several reasons. A positive internal gaseous pressure is produced in the blanks, and this contributes considerably in reducing porosity. The paraffin used as a temporary

binder for shaping in the powder stage is readily removed from the furnace at relatively low temperature, far below the reaction temperature of the tool material. This also reduces inherent porosity. Porosity directly influences impact strength and should be held to a minimum.

Another critical reason for using a vacuum heating procedure instead of hydrogen atmosphere heating is to prevent the formation of hydrides. The "alloy" carbides (Ti, Ta, Cb) are more prone to react with the hydrogen atmosphere than tungsten carbide. The hydrides cause a reduction in impact strength. Thus, vacuum heating is even more desirable for the steel cutting grades, which contain appreciable amounts of these alloy carbides.

To evaluate each batch (pre-mixed and ball-milled powder) of a given grade, standard "test tips" are processed prior to release of the batch for production use. After test tips have been pressed to size and processed through the prescribed heating cycle, they are examined thoroughly in a variety of tests which through experience have been correlated with performance life of the carbide tool.

Tool failure through minute edge chipping is related to the strength of the carbide bond produced in sintering, and to the inherent porosity. This property is measured by applying the transverse rupture test to the test tip. The test tip is diamond ground (220 grit) to a 0.200″ x 0.375″ cross-section, and then broken by center loading of a 9/16″ span. Each grade has a minimum transverse rupture strength (the catalog value), which must be exceeded by the test tip for approval of the batch.

The edge wear on a tool is related to the hardness, the cobalt content, and the type of metallic carbide blend. Tungsten carbide has the highest resistance to wear of the various metallic carbides, and wear applications normally utilize an alloy of tungsten carbide and cobalt alone.

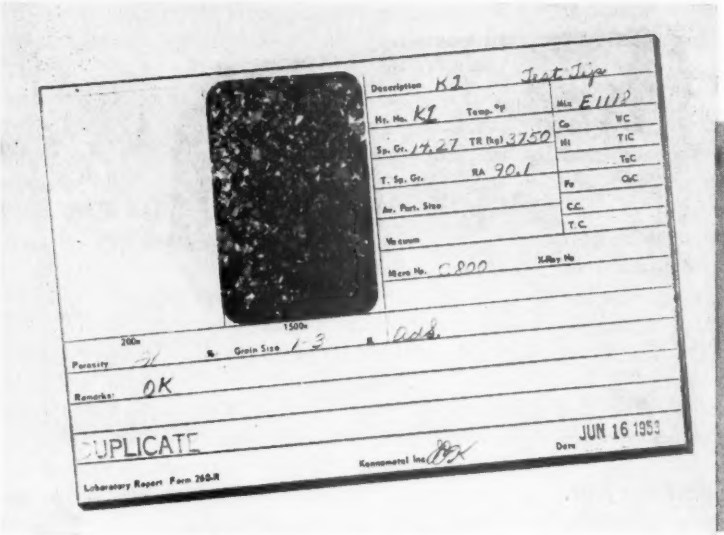
Intermittent cutting makes greater demands on the shock or impact resistance of the tool than continuous cutting. The impact resistance is related to the transverse rupture strength, which in turn is a function of cobalt content and the type and blend of metallic carbides used. Higher percentages of cobalt and greater transverse rupture strengths increase the impact resistance.

The hardness of each tip is determined in a very critical procedure. The Rockwell A scale is utilized with a special diamond indenter, a 220 grit diamond ground specimen surface, and using carbide blocks of known hardness as reference standards. The allowable hardness tolerance from the catalog value for any grade is ± 0.3 point Rockwell A.

Craters are formed due to the effect of a continuous chip heating the tool surface as the chip passes over it, locally melting the cobalt and reducing the bond of the carbides to each other. This allows the chip to minutely erode carbide particles, eventually producing a visible crater.

Hardness testing in the Production Section's physical laboratory.

Metallographic examination of specimen (located on top stage).


Description K2 Test Tips
Ht. No. K2 Temp. °F Mix E1112
Sp. Gr. 14.27 TR (kg) 3750 Co WC
T. Sp. Gr. RA 90.1 Ni TiC
Av. Part. Size Fe CbC
Vacuum CC
Micro No. 5800 X-Ray No TC
Porosity A Grain Size 1-3 B Dark
Remarks: OK
DUPLICATE
Laboratory Report Form 260-R
Kennametal Inc.
Date JUN 16 1953

Standard record care for coordinating test and other pertinent data for a particular production powder mix. Such records are maintained permanently for all mixes.

Tungsten carbide compositions crater badly on steel cutting operations. Alloy carbide additions to tungsten carbide compositions greatly reduce the catering tendency. This is due to the character of the oxides formed. Tungsten oxides are non-adherent, and spall readily. The alloy carbides form adherent oxides of lower thermal conductivity, and these reduce the amount of heat transferred into the surface layers of the tool.

The crater resistance of a carbide tool is a function of the type and amount of alloy carbides added to the basic cobalt and tungsten carbide material. The alloy carbides are those of tantalum, titanium, and columbium, and may be added in either single or complex form.

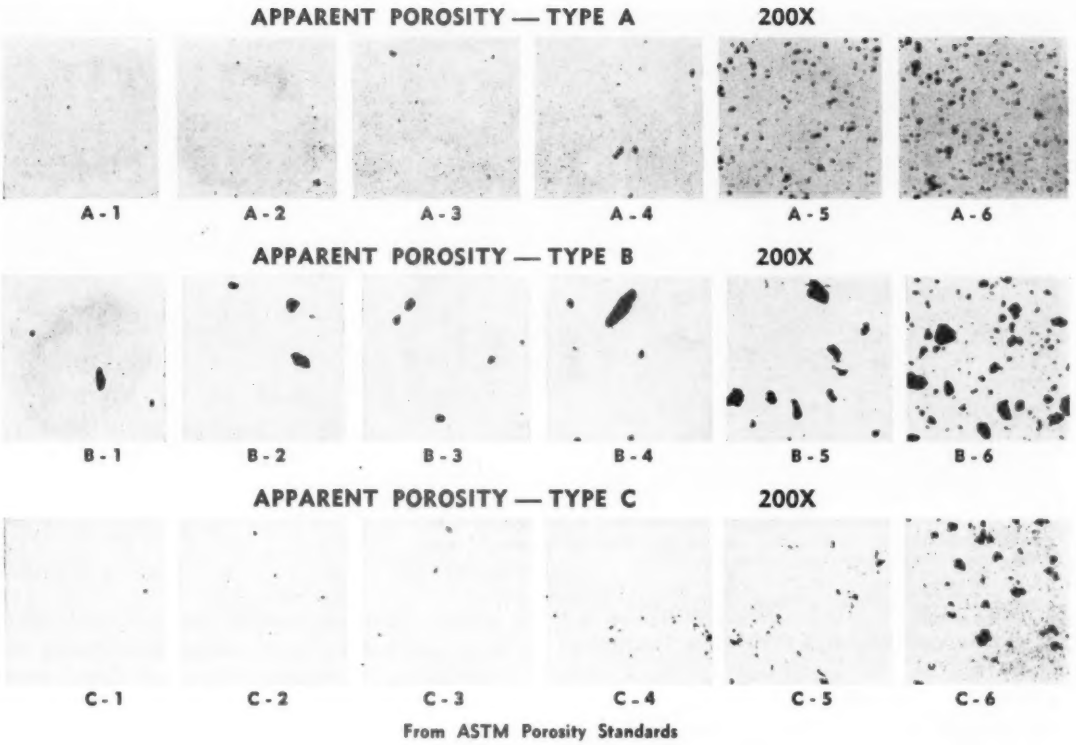
The use of complex alloy carbides appears to be more effective, when viewed from the standpoint of the reproducibility of successive batches of a single tool material analysis. Complex alloy carbides have greater affinity for taking tungsten carbide into solution than do single alloy carbides.

Two metallographic examinations are utilized to check the microstructure of the carbide tool materials.

After a surface has been 220-grit diamond ground, it is lapped on a succession of diamond impregnated surfaces. The eventual result is a 0.5 micro-inch finish on the specimen. Examination at 200x of this polished surface provides information on the porosity of the material. Porosity in a tool promotes continual minute edge breakdown (or rapid wear). An excessive amount of porosity will lower tool life, the measure of "excessive" being determined by observation of the tool in operation under study. An excessive amount of porosity

View of electrodes and combustion chamber of the spectograph.

Interpreting spectographic plate in chemical analysis of test tip.



From ASTM Porosity Standards

in a tool will also limit the smoothness of the workpiece finish. Porosity promotes minute chipping of the working edge of the tool.

Kennametal utilizes the ASTM tentative standards for porosity (see illustration). Types A and B are distinguished by the difference in size, while Type C consists of clusters. Type C porosity is definitely undesirable and is cause for rejection in any grade. For normal applications, type B is tolerable to class B-2 and type A is tolerable to class A-4. Die grades have more critical porosity requirements, neither types B or C being tolerable. Type A porosity may extend only to class A-2 for die grades. Porosity is an inherent characteristic of the powder metal nature of cemented carbides. It is presently impractical, if not impossible, to obtain absolute freedom from porosity.

The final apparent grain size is a function of both the initial particle size and the heating cycle. The final apparent grain size is determined by etching the polished specimen surface with a suitable reagent, and examining the etched surface at 1500x. The range of permissible apparent grain size varies for each specific grade, and is dependent upon the chemical composition and the intended application of that particular grade.

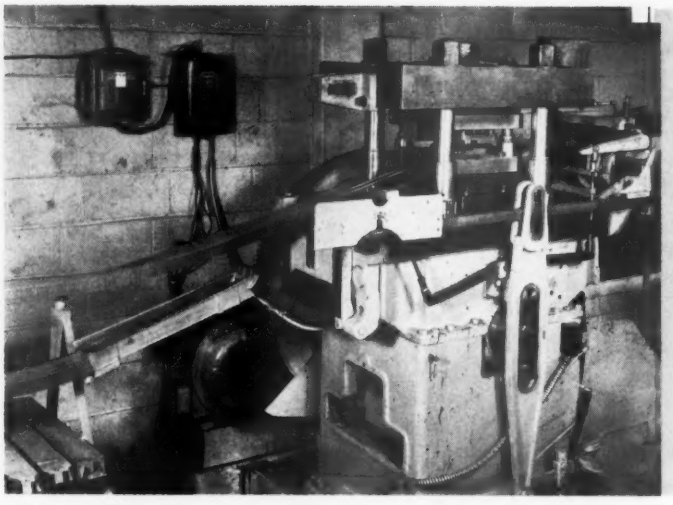
Excessive grain size and/or poor grain size distribution will make the tool material more sensitive to thermal shock cracking in grinding and in use. Poor cobalt also contributes to this, and lowers the shock resistance.

All the previously mentioned examinations are critical, and, to be released for production use, each powder batch must meet the standards set for its grade. A file card is used to keep a coordinated record of each batch.

To further ascertain the quality of production, additional examinations are made. As each production order is removed from the furnaces, samples from each tray are checked for hardness in the standard manner. Samples are likewise taken from production for metallographic examination.

In addition to these production examinations, a regular weekly sampling of the finished stock in the Shipping Department is conducted. Two inserts of each stocked grade are taken from the bins, ground to the standard test tip dimensions, and given the standard examinations. Deviations from the accepted standards are cause for resampling. If a consistent deviation is noted, the particular group of inserts are withdrawn from the Shipping Department and then scrapped.

Periodic conferences between the production, quality control, and research departments supplement these regular activities. These rigid methods of quality control result in consistently long, low cost tool life for metalworking manufacturers.



SECTIONAL CARBIDE LAMINATION DIES

by Ernest J. Urbas
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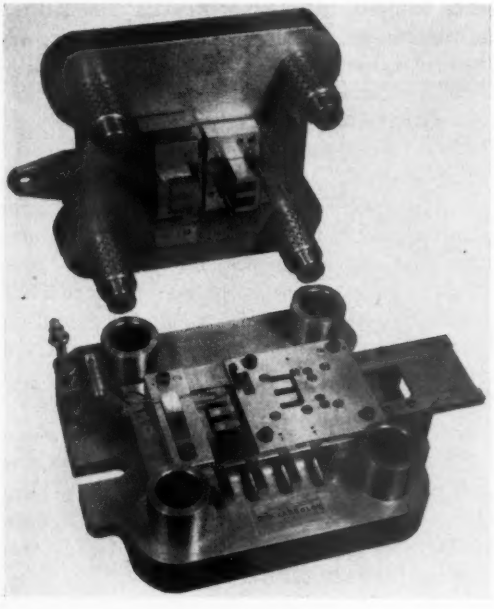
Fig. 1. This twin chute arrangement receives two transformer E laminations from the die and inverts one so that the laminations in both chutes are stacked properly for assembly.

TO THE CASUAL OBSERVER, the preformed cemented carbide lamination dies in the accompanying illustrations may seem to appear basicly simple in design and appearance, but in reality they are a complex and compound series of associated geometric patterns, interlaid and integrated in a manner which took years to evolve. These dies are built with such exacting precision that even scrutiny of the dies themselves will not reveal any telltale evidence of the connecting joints of the finish ground carbide sections.

To achieve perfection and longevity of die life in the sectional carbide lamination dies, it is necessary to employ diamond grinding wheels, precision grinding machines with built-in optical comparators, and special holding devices to assure and simplify duplication. Most essential of all are the know-how of die design and the extreme manual skills involved in the art of "splitting tenths."

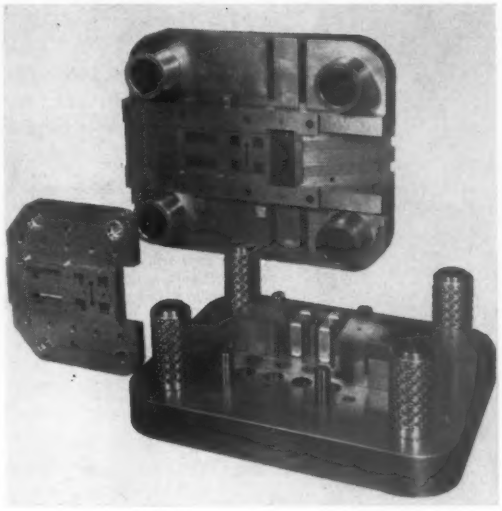


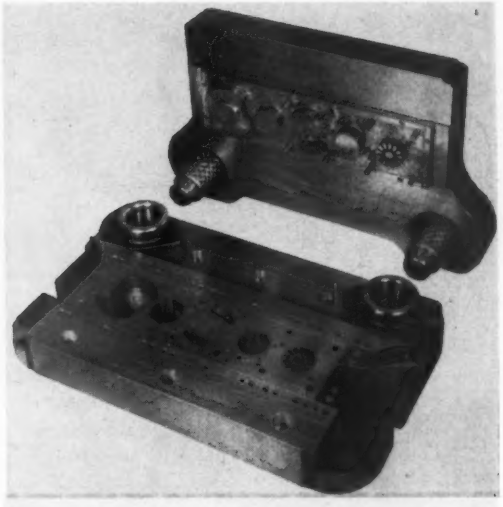
Motor and transformer laminations are produced from these dies in such tremendous quantities that the production is almost unlimited. The carbide dies are so resistant to wear and abrasion that production runs of two million pieces are possible before sharpening is necessary. However, sharpening at every million and a quarter pieces will permit the longest die life, for then only .003″ need be removed to recondition the die.

To facilitate the handling and removal of these laminations, ingenious chutes are employed. The original loading of the stacking chute is of paramount importance and every care and consideration should be given to this phase of the setup. In as much as the proper method of mounting the stacking chute is to secure it to the bolster rather than to the die considerable productive press time is gained because once the stacking chute is fully loaded it remains loaded thereafter, even though the die may be removed for sharpening or maintenance. Only when the die is removed from the press to be replaced by one producing another style of blank should the stacking chute be emptied.

Loading the stacking chute may differ de-

Fig. 2. Using the double interlay pattern this carbide die produces E laminations. Note the automatic feed finger which is cam activated by movement of the upper die member.





pending on the nature or shape of the stamping. Sometimes a piece of rubber, about two inches thick, shaped or cut to fit the die opening is pushed up to the level of the cutting edge. This rubber, as it moves down the chute with each stroke of the press, will have enough friction against the stacking chute guides to keep the blanks upright and still be flexible enough to follow the curve of the chute. Another method in loading the chute, especially with small parts, is for the operator to hold a flexible or rubber hose up to the cutting edge and against the blanks as they come from the die, thereby keeping them upright, until enough blanks have come along to reach the spring-loaded brake plate at the far end of the chute, when the hose can be removed. Stuffing the entrance opening of the stacking chute with rags or paper is also possible but the risk of a jam, causing serious if not complete destruction of the stacking chute is very likely.

Inspection of laminations is simplified when stacking chutes are employed for a bad piece is very noticeable when the parts are together in a stack. The laminations are removed from the stacking chute in uniform assembly lots by inserting rods into the pierced holes of rotors and stators. Transformer E and I laminations are manually loaded into formed channel boxes of a size or capacity to facilitate assembly operations.

Illustrated in Figure 1 is a clever and ingenious design of twin chutes delivering from the same end of the press. It is bolster mounted, receiving two transformer E laminations delivered by a scrapless carbide die. One of the laminations is blanked through the die while the other is cut off by the same blanking

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Fig. 3. (above, left) This carbide automatic die, of double E pattern produces scrapless laminations. It is the die running in the setup shown in Figure 1.

Fig. 4. (above) Incorporating preformed carbide sections, this rotor and stator lamination die is one of the first carbide lamination dies to be built.

Fig. 5. (below) The design of this carbide automatic die produces scrapless E and I laminations.

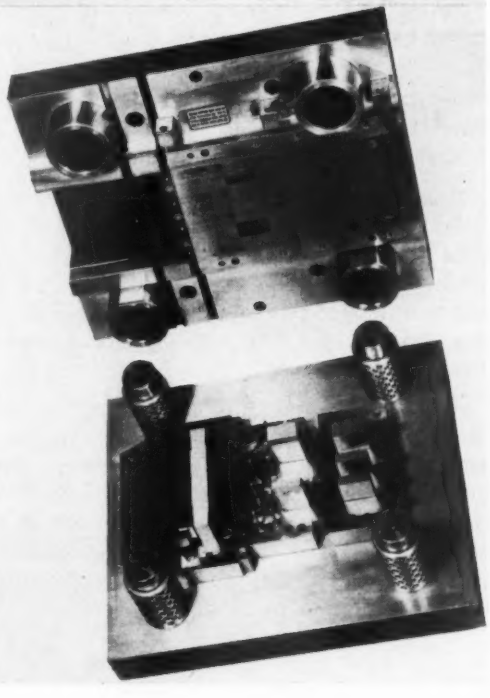

Fig. 1. On this Heald 4-spindle double-end Borematic, Carboloy tools precision bore and turn two pieces simultaneously, while two other pieces are unloaded in pneumatic chucks. Machining time—43 sec.

PRECISION BORING

. . . with Cemented Carbides

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PRECISION BORING is a finishing operation in which a single cutting tool point is used to obtain a geometrically true hole in a workpiece. To be geometrically true, the hole must be round and straight.

Precision boring operations are used to bore holes in those parts where the surface finish thus obtained is satisfactory with no further work to be done. Also, holes that are to be honed or lapped to final size and surface finish are first precision bored to produce a round, straight hole.

Another phase of precision boring is that of boring multiple diameter holes along the same axis. This technique is further expanded by adding facing cuts to establish shoulders of smaller bores precisely located in relation to other surfaces and, in some cases, establishing internal or external profiles in conjunction with the bores.

Machine tools necessary to do these various operations range from a screw machine for simple boring on larger workpieces, to the single-purpose precision boring machines equipped with a cam-controlled feeding mechanism which produces the complex movements necessary for profile boring. Likewise, the machines vary from those having a single spindle, to others with multiple spindles. Production quantities usually dictate the number of stations in a machine, whereas production quality governs the type of machine.

To obtain the utmost in surface finishes, the finest of precision spindles are required. Closer control of machine conditions is also a must. Such items as a leaking or sticking valve in the hydraulic system, or a slightly loose cam follower, will result in machined parts being outside of specifications or in broken tools.

Multi-spindle machines having belt-driven spindles have been known to break tools be-

cause of vibration set up by one set of belts. A case of poor tool life which was being experienced on a four-spindle horizontal boring machine, was traced to one of the spindles having a slightly defective bearing. While the spindle was running true enough to produce work parts within tolerance, it produced vibration enough to reduce the life of tools on the other three spindles. By cutting this spindle off, by removing its belts, tool life on the remaining three spindles came back to normal.

Vibration of a degree sufficient enough to upset a precision boring operation can be induced by other sources than the machine itself. Heavy machines located relatively close to a precision boring machine can produce conditions resulting in reduced tool life and poor finishes. Heavy chatter from a machine some distance away has been witnessed to reproduce its chatter pattern in the finished surface of the workpiece being bored.

Boring bars used in these operations are mostly special and are designed to be used on the workpieces for which they are respectively intended. The bars are usually of two general classifications—rotating or stationary. A rotating bar requires that considerable attention be given to its running balance. Since rotating bars commonly incorporate an adjustment for size control in their mounting flange, the amount of tool bit adjustment off center is slight (usually not over 0.0005" either way) and therefore is not enough to induce vibrations which would seriously affect tool life. Rough adjustments are made at the tool, with final fine adjustment taken on the flange to bring the cut to specified size.

Stationary bars need no consideration for balance. Coarse adjustments are usually made at the tool, with the final fine adjustment made at the holder.

Boring bars can be classified further as to piloted and unpiloted bars. Bars having pilots can only be used on through-holes, and all adjustments for size must be made at the tool itself. Some bars incorporate micrometer adjustments at the tool, whereas others provide adjustment of the tool by means of a fine-thread, back-up screw. Unpiloted bars are most popular in use and can be used for blind holes as well as through-holes.

Boring bars can again be further classified by the material of which each bar is made such as steel with carbide stiffeners, solid carbide, or steel or carbide with vibration dampeners.

A solid steel bar can be used safely when the hole to be bored does not exceed the ratio of

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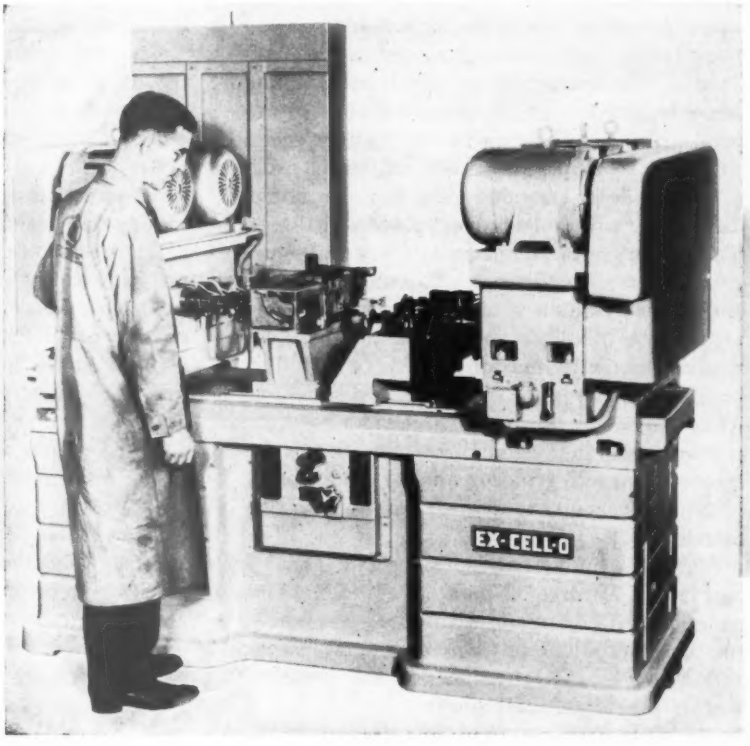

Fig. 8. Cam controlled carbide tools on this Ex-Cell-O Style 17 precision bore machine perform multiple operations with extreme speed and accuracy. Good rigid tooling assures the machine delivering the performance it is capable of.

The positive control of tool grinding motions made possible by a sliding fixture enables relative inexperienced operators to do better grinding in less time and at lower cost.

USE OF SLIDING SUB-TABLES IN GRINDING SINGLE POINT TOOLS

by David C. Kauffman

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THE GRINDING of carbide tools is the largest single cause of diamond wheel consumption. Any process or fixture which can assist in the conservation of expensive diamond wheels has great economic justification. Such a fixture is the ball bearing sub-table designed to fit almost every type of off-hand grinder, whether wheel or belt type.

While the emphasis of this article is properly placed on diamond wheel conservation, the sliding sub-table proves of equal value in labor savings and improved tool grinding in connection with the use of diamond wheels and silicon carbide wheels or belts. The fixture makes possible corrective measures for many commonly encountered poor grinding practices. The end result is that diamond wheels are conserved, expensive labor costs are reduced, grinding department capacity is increased, and tool grinding quality is improved; with emphasis on the savings in labor and diamonds.

When a grinder hand attempts to grind a tool on the average off-hand grinding machine he meets with many disadvantages. Primarily, the tool does not slide freely on the table back and forth against the face of the diamond wheel; the table surface often is rough and dirty. The protractor which also has to slide, may tend to stick in the table slot and then jerk past or into the wheel. Many operators have experienced this and have gouged out a piece of wheel, tool or knuckle, or all three at the same time.

Because operators are constantly aware of the danger to themselves of over-running the sides of the diamond wheel, most grinding is done only in the center portion of the wheel.

An additional hazard in free-hand grinding comes from applying forward pressure to the tool against the wheel. This forward feed has to be controlled lest it be too great and cause gouging or burning of the wheel; yet it has to be positive enough to enable the wheel to cut the tool. The advantage of using the sliding fixture for the forward motion can be appreciated by trying out a tool on a grinder so equipped and seeing how easily the tool slides forward under perfect control.

The manual coordination of correct and uniform pressure, and avoiding jerky movements either against the wheel or back and forth on the face of the wheel, is extremely trying on grinder operators. The result of these very poor practices is that the center portion of almost any wheel you will find in the average cutter grinding department is worn away, leaving high sides on the wheel as illustrated in sketch "A", Figure 1. Check the wheel by putting a flat scale against the wheel and

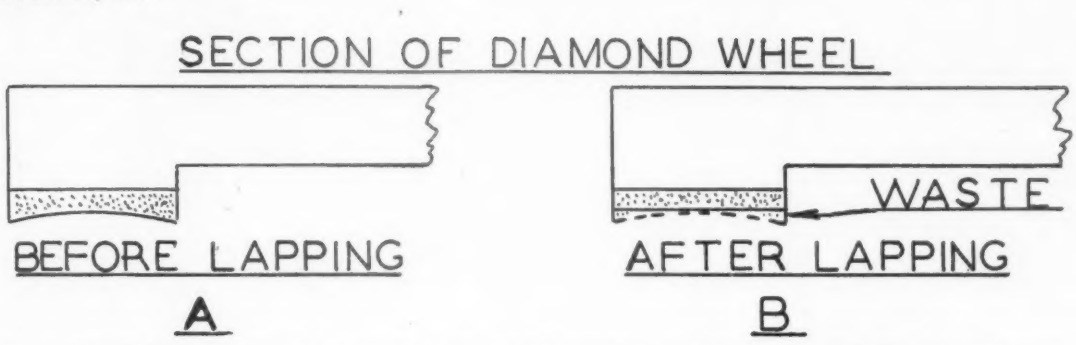

Fig. 1. Uncontrolled and inexpert free-hand tool grinding "dishes" the diamond wheel face as indicated at A. This necessitates the periodic removal by lapping of valuable diamond material, B, in order to restore the wheel face to true flatness.

note the hollow in the middle.

This hollow condition, in turn, causes improper shapes on the tool. It soon becomes necessary to resurface the wheel, which is done by lapping the wheel with carborundum grit on a flat face plate until the face of the wheel is properly restored.

The result is a waste of valuable and critical diamond material; in some shops often up to 50% of a wheel is lapped away in this fashion. Sketch "B", Figure 1, indicates how much of a diamond wheel is wasted after lapping.

Use of the sliding fixture will prevent the wheel from grooving or wearing out in the center. As the operator starts to grind with the tool on a sliding fixture he can readily approach the wheel at any point he chooses with a smooth even motion and start oscillating the tool at the moment of contact with the wheel. Pressures of infinite variety can be used and controlled; movement back and forth is free and easy. The entire surface of the wheel from side to side can be used without danger to either the operator or wheel. A few seconds of oscillating motion and the tool edge is finished.

It has been proved in many shops that the diamond wheels need never be removed for truing or straightening when a sliding fixture has been in constant use. The wheels do not become grooved, unevenly worn or gouged.

Another economy that can be effected by the use of the sliding or oscillating fixture is that narrower-faced wheels may be employed. Common practice is to have the wheel at least as wide or wider than the length of the tool's cutting edge. The cutting edges of tools are on the average about ½" to ¾" long. Hence the flat face diamond wheels in use in most grinding departments are ¾" to 1" wide. Such wheels are very costly.

It is unnecessary to have a wheel this wide. With the use of the sliding fixture and a wheel only ⅜" wide, the location of the initial contact of the tool and the wheel can be accurately determined; the smooth and positive action of the oscillating table can confine the tool to the wheel and not over-run the edges of the wheel. The cutting action of a narrow wheel is better and faster; the tool remains cooler and grinding time reduced.

Tools that have been rough ground on green wheels usually have incorrect angles and uneven surfaces. When these tolls are finish ground on the diamond wheel the operator will inevitably grind them the same way each time. In most instances there is a high point on the

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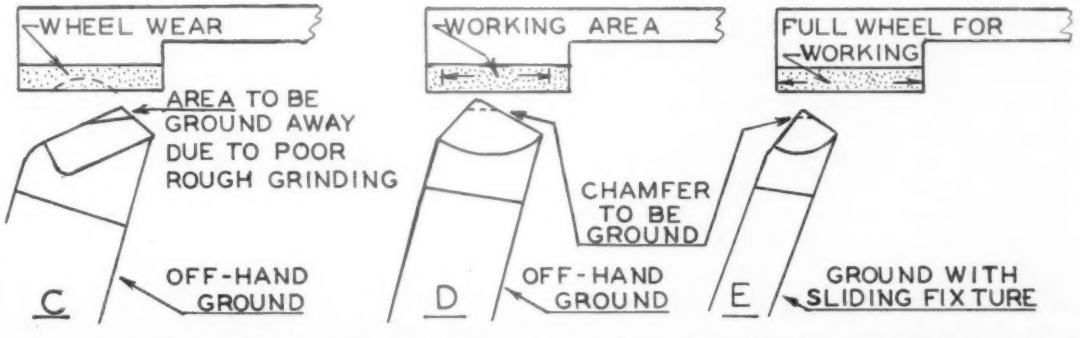
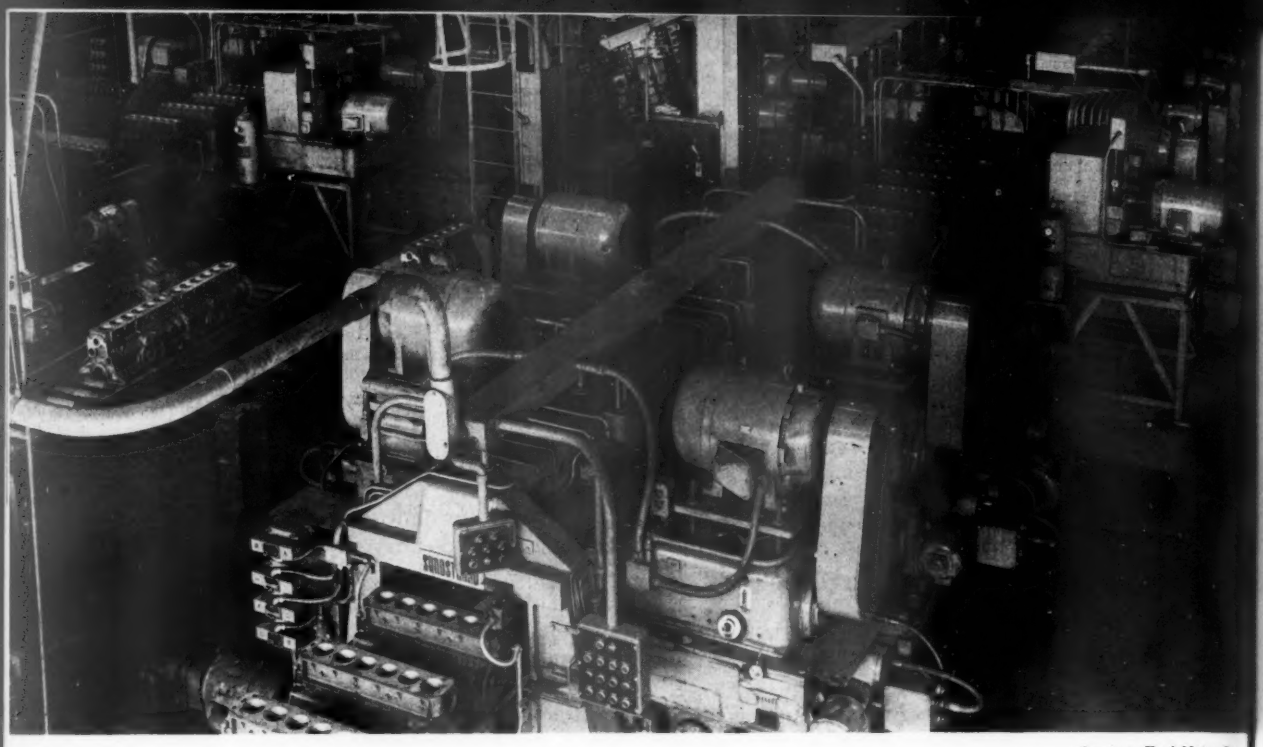


Fig. 2. A high point on a tool to be finish ground causes excessive wheel wear by the initial contact of the tool with the wheel, as at C. In the free-hand grinding of tool chamfers the operator does not make full use of the wheel face, D, while the sliding fixture enables him to make the most economic use of the entire wheel face, as at E.



Courtesy, Ford Motor Co.

TOOLING FOR AUTOMATION

by Bennett Burgoon, Jr.
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THE DEGREE to which a fully automated production machining line can be realized depends first and foremost on the cutting tools. What are the requirements?

The cutting tool material must be durable, not only durable enough to withstand wear throughout a normal production run (usually an eight-hour shift) but also durable enough to withstand shock, both mechanical and thermal—shock that is caused by the normal variables encountered in any high production machining setup. These variables include variations in the machinability of the metal. There are coolant variables such as a change in the coolant solution itself or fluctuations in the amount or in the manner in which the coolant is applied to the cutting action. And, then, there are many other mechanical factors in any production machining setup which vary from time to time.

A second and vitally important requirement for cutting tools for automation is rugged tool design. The tools must be designed for continuous performance, which means a different approach to their design than if they were intended for a short run machining job. Tooling must be designed to avoid trick regrinding problems, in order that performance of the tools can be maintained on regrinds.

The success of any automated production machining line depends heavily upon one other factor in the tooling, and that is the reduction of downtime for tool changes to a very minimum. Obviously, a series of complex machining operations interlocked in an automatic setup will become very costly when the entire line is stopped for 20 or 30 minutes while a setup man makes a tool change.

Carbide Offers Durability

What are the answers to this set of requirements for tooling for automation? Certainly cemented carbide is the answer to the first requirement, a durable cutting tool material. But, carbide is not the answer unless it is prop-

erly applied. That is, unless the correct grade is used, and unless it is run at the best speeds and feeds for each specific machining operation. It is not always possible to cut at the most desirable speed; but, fortunately, carbide as a rule permits a fairly broad speed range. It is possible to select the right grade of carbide, even though grade selection is complicated by the more than 80 different grades of carbide on the market, which represent a wide variety of compositions.

Kennametal is making an effort to simplify grade selection by grouping grades into three categories according to their wear characteristics. Type "A" in Figure 1 covers the crater-resistant carbides in three grades—hard, general purpose, and strong. These grades are used where crater or top wear is the major wear problem; for example, in machining heat-treated alloy steels and also for cutting very soft steels where the material has a tendency to build up on the cutting edge. An intermediate group, listed as type "B", covers a wide range of machining operations. Grades in this group offer a combination of resistance to crater and edge wear. In this group, there are both a general purpose grade of medium hardness and a hard grade for lighter cuts. The third group, type "C", covers essentially straight tungsten carbide compositions which have maximum resistance to edge wear. These are the grades usually referred to as "cast iron cutting grades".

While carbide grades are usually referred to as "cast iron" or "steel cutting" grades, the variety of materials being machined today makes this classification inadequate. Stainless steels, which as a group cover a wide range of machinability, high temperature alloys, new types of alloy irons, and many new non-ferrous metals require a classification of carbide grades by wear characteristics plus a knowledge of the machinability of the various materials in order to get the right carbide grade on the job.

CARBIDE GRADES		
TYPE A CRATER RESISTANT	GENERAL PURPOSE K3H	
	STRONG KM	HARD K5H
TYPE B CRATER AND EDGE WEAR RESISTANT	GENERAL PURPOSE K2S	
	HARD K4H	
TYPE C EDGE WEAR RESISTANT	GENERAL PURPOSE K6	
	STRONG K1	HARD K8

Fig. 1. Classification of carbide grades by wear characteristics helps to simplify grade selection.

Insert Tools Reduce Downtime

Just what can be done about tool design in order to meet some of these other requirements for automation? In the case of single point tools, the use of indexable inserts has been the means of simplifying tool regrinding and reducing downtime for tool changes.

The Kennamatic tool (Fig. 2), which employs round, triangular, square or diamond shaped inserts, is now widely used for turning, facing, and profiling operations. These inserts have been responsible for tremendous savings in downtime and in tool regrinding costs on production machining operations. They represent the basic tools for single point tooling for automation. The 1½" long carbide insert is held by a clamp in an accurately broached hole tilted 7° for clearance. Thus it cuts the same diameters on each index. This method of mounting a tool limits its use to cuts where there is sufficient clearance for the tool holder.

. . . Continued on page 96

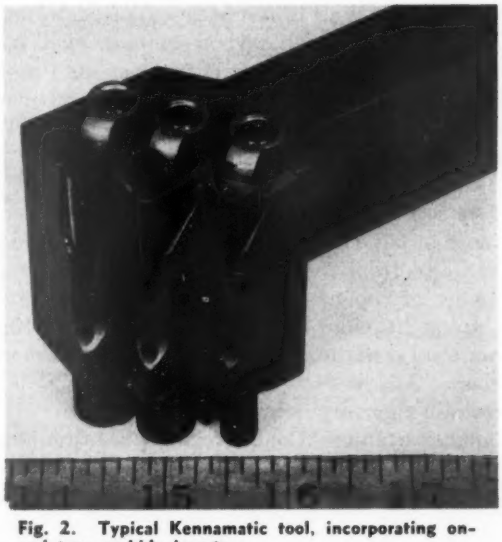


Fig. 2. Typical Kennamatic tool, incorporating on-end type carbide inserts.

Carbide Tips on Machining Titanium

You have titanium problems?

Here are a few solutions!

A bit of information about titanium and its alloys which received widespread distribuion recently has been disproved. The report that titanium and its alloys tend to work harden easily, something like stainless steel, is not true, according to recent experiments. The material, it is found, is more in the class of SAE 1045 where work hardening is no problem.

In machining titanium alloys, Carboloy Department of General Electric Company, Detroit, reports tool failure on all tools is generally due to excessive cratering on top of the tool. This problem, however, can be reduced with a proper grade of cemented carbide, although the low modulus of elasticity (stiffness) of titanium may cause chatter or vibration of the workpiece if it is not rigidly supported. One way to get around this latter condition is to hone a 45-degree land on the cutting edge 0.005 to 0.010-inch wide. If this does not provide the desired results, reducing the feed may be the answer.

As hardness of the work material rises above Rockwell 37, tool life may be expected to fall sharply. Also, high carbon content, over 0.2 per cent reduces tool life because of the titanium carbides being formed. Even a variation of carbon below this figure, Carboloy Department says, may cause differences in tool life.

The use of coolants of the synthetic emulsion type is beneficial to tool life especially when the tool is flooded from both the top and side and also from the bottom.

One of the most important factors in machining titanium is to determine whether the material is in the commercially pure or alloyed class. Alloys such as Ti-140A and RC-130B contain about 8 per cent alloying elements and balance titanium. Commercially pure titanium such as Ti-75A contains about 1 per cent impurities, and the balance titanium.

If you plan to machine titanium alloy forgings with cemented carbides, you should select carbides similar to grade 44A or a special grade like 55A. The former should provide good tool life on the oxide scale, the latter grade being used for more severe cases. In this instance, tools should have as large a nose radius as possible, but the radius may have to be reduced to as small as 1/32-inch in an effort to reduce chatter, if present. The tool should be run at about 50 fpm with 0.010 to 0.020-inch feed, and ¼ to ½-inch depth of cut.

For heavier depths of cuts, more than ½-inch, on irregular cast ingots, use a shear type tool with 40-degree negative back rake, 15-degree positive side rake, 15-degree side cutting edge angle and 7-degree relief. Be sure to hone the cutting edge and keep the nose of the tool under the scale at all times.

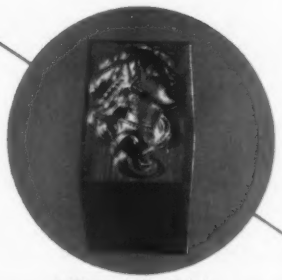
If no scale is involved in semi-roughing, a cemented carbide grade like 883 provides fair tool life at about 150 to 200 feet per minute with feeds of from 0.010 to 0.020 inches per revolution and ⅛ to ¼-inch depth of cut. Successful tool designs here are: 5 to 7-degree side rake, 0-degree back rake, 45-degree side cutting edge angle, 5-degree end cutting edge angle 0-1/64-inch nose radius and 10-degree relief on side and end, or a triangular insert with ⅜ or ½-inch inscribed circle; or a round insert with ½-inch diameter.

For finish turning, boring and facing, use a carbide grade like 883 but for exceptionally long tool life, where production warrants, a special cemented carbide grade like 999 gives an excellent surface finish and good tool life at 300 feet per minute. For such work, use a round insert tool, triangular insert tool or tool with similar negative side rake angle, 0.005 to 0.010 feed per revolution and 1/64-inch to 1/32-inch depth of cut.

When milling titanium alloy a good tool life is obtained with grade 883 at approximately 350 surface feet per minute using 0.003-inch feed per tooth, on a climb type face milling operation. No coolant is recommended. Use 0-degree rake angles and a 45-degree lead angle with a sharp nose.

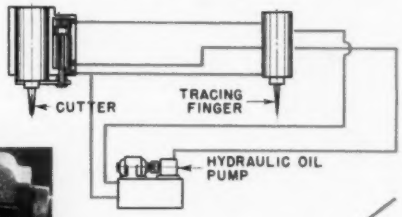
When machining commercially pure titanium such as Ti-75-A use the same tools, grades of carbides, feeds and coolants as for titanium alloys but about double the speeds.

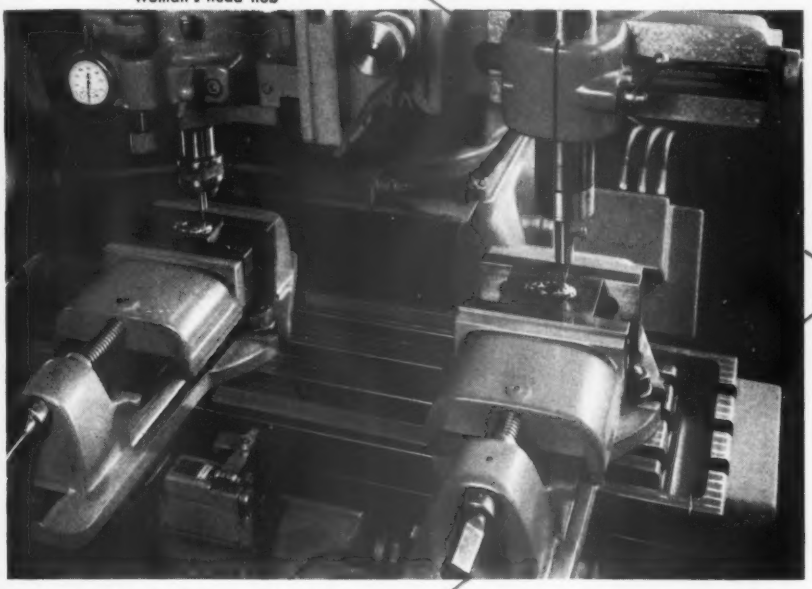
Automatic Sculpturing



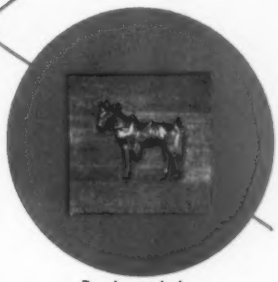
Woman's head hob

Expertly sculptured in metal by the deft touch of the tracing finger on a CINCINNATI 8" x 18" Tool and Die Miller.

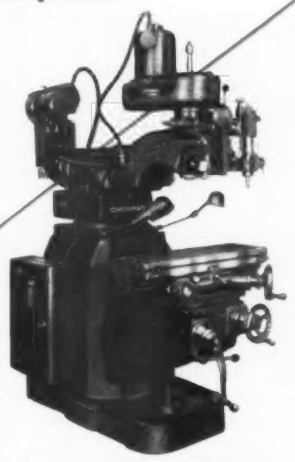




Fine details in master of woman's head are captured in the hob by the Automatic Hydraulic Depth Control Unit on this CINCINNATI 8" x 18" Tool and Die Milling Machine.



Toy horse hob



CINCINNATI 8" x 18" Tool and Die Milling Machine. Complete specifications may be obtained by writing for catalog No. M-1731.

Have you ever tried sculpturing? It's slow, tedious work, and a slight miscue near the finish can spoil days or weeks of painstaking labor. "Sculptors" of metal—America's diemakers—have the same regard and pride for their work as sculptors in stone. But they have one big advantage over their more arty brethren . . . they can employ *automatic tracing* over a master to reproduce minute details much faster and more accurately than could ever be done manually. CINCINNATI 8" x 18" Tool and Die Millers are equipped for this type of work; *automatic, sensitive tracing* through the Automatic Hydraulic Depth Control Unit. There's no chance for a miscue at any time, not even if the cutter breaks. The operator merely rotates the table or cross traverse handwheel, while the automatic unit takes care of the vertical movement of the cutter to form the die cavity or profile. ¶These efficient diemaking machines give you two worth-while secondary advantages; accuracy of reproduction and quality of finish are so good that subsequent hand finishing is cut way down. ¶Does the CINCINNATI 8" x 18" Tool and Die Miller sound like a candidate for the first team in your shop? These machines are your best buy for producing accurate, low-cost molds, hobs and dies, from the size of those illustrated here to larger ones up to an area of 8" x 18". Catalog No. M-1731 gives you a better indication of their possibilities. Brief specs. in Sweet's Machine Tool Catalog.

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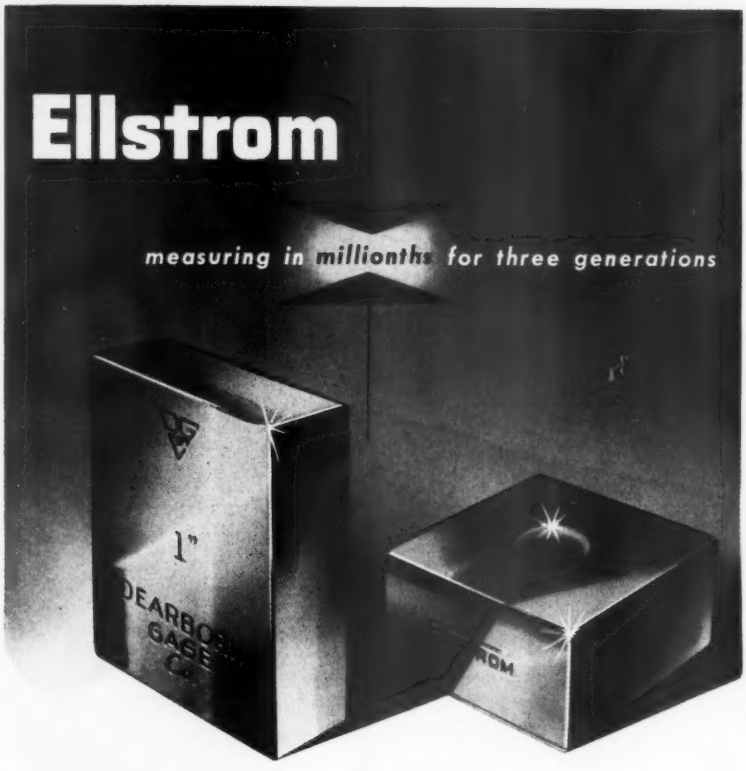

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A Universal Drilling Machine

An entirely new type of industrial drilling machine, called the Magna Drill is a machine tool that makes possible quick, accurate setups for simultaneous multiple drilling or tapping, in more than one plane. It removes all

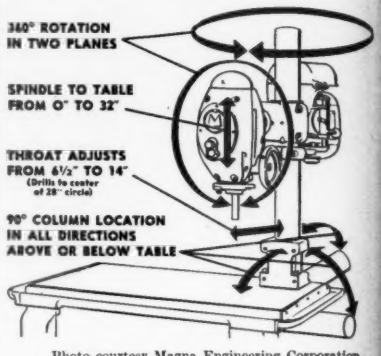
360° ROTATION IN TWO PLANES
SPINDLE TO TABLE FROM 0" TO 32"
THROAT ADJUSTS FROM 6½" TO 14" (Drills to center of 28" circle)
90° COLUMN LOCATION IN ALL DIRECTIONS ABOVE OR BELOW TABLE

Photo courtesy Magna Engineering Corporation.

Fig. 1. This illustration demonstrates the adjustments which make possible the flexible positioning of the Magna Drill head.

former limitations on locating drills or similar tools in relation to work pieces.

Basically, the Magna Drill consists of standardized, individually powered, adjustable drill heads with a mounting system of

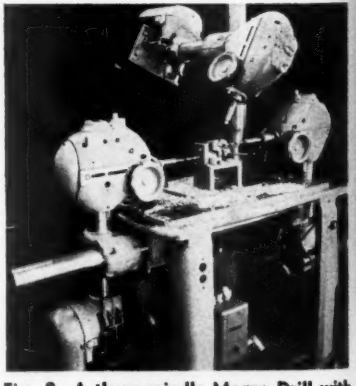

Fig. 2. A three spindle Magna Drill with packaged power feeds drilling three holes simultaneously in an aluminum casting. This photograph shows one drill head mounted on a vertical column, while two heads are mounted on a column passing horizontally under the table.

ground steel tubes and joint castings that permit unlimited flexibility in locating any number of spindle axes independent of each other. Each spindle operates in-

. . . *Continued on page 104*

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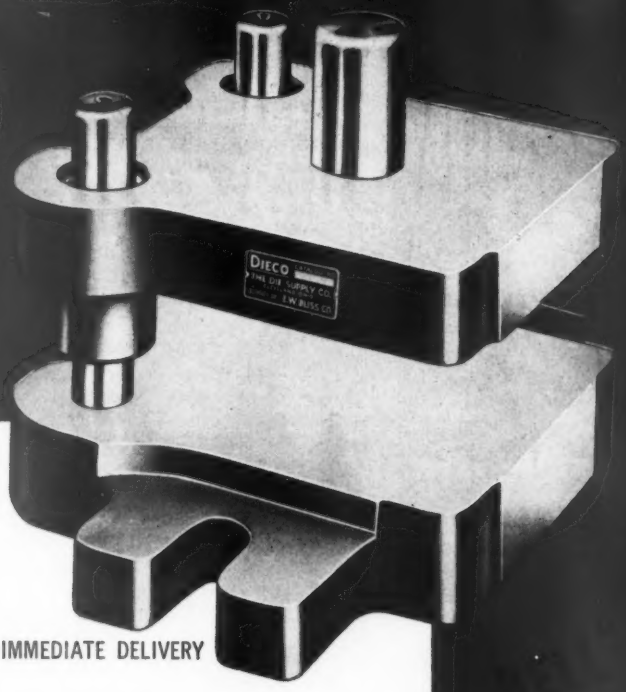

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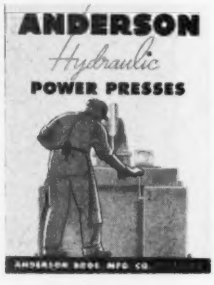
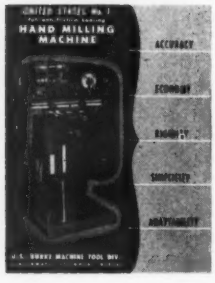
News and Views of Current Literature

"Stampings in Small Lots" is the name of Catalog #718 presented to TOOLING and PRODUCTION readers by the HPL Mfg. Co., 15210 Miles Ave., Cleveland 28, Ohio. Its 4 pages are filled with illustrations and details on the services rendered by HPL in the producing of small lot stampings.
Circle Inform-A-Gram No. E1.

Power Transmission Products are the theme for this 4-page brochure just released by the Lovejoy Flexible Coupling Co., 4965 W. Lake St., Chicago, Ill. Included in the literature is data on flexible couplings, variable speed pulleys and transmissions and universal joints.
Circle Inform-A-Gram No. E2.



Anderson Hydraulic Power Presses, products of the Anderson Bros. Mfg. Co., Rockford, Ill., are illustrated and described in this interesting 4-page folder. Featured are the stationary and traveling ram types of 10 and 25-ton capacities plus attachments, applications and specifications.
Circle Inform-A-Gram No. E3.



Milling Machines. Suggestions as to how a U. S. No. 1 milling machine can cut costs on particular production needs, as well as complete data from the U. S. Burke Machine Tool Div., Brotherton Rd., Cincinnati 27, O. Literature available.
Circle Inform-A-Gram No. E4.

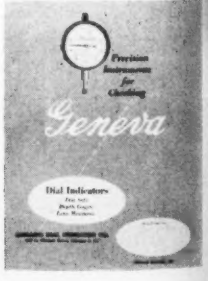
Tapping Machines for sensitive high-speed single or multiple tapping are illustrated and described in Bulletin No. 72A put out by Ettco Tool Co., Inc., 594 Johnson Ave., Brooklyn 37, N. Y. The 4-page folder is jam-packed full of data, including dimensions and specifications.
Circle Inform-A-Gram No. E5.

For Precision Grinding. A new brochure, prepared by Reid Brothers Co., Inc., Beverly, Mass., describes the firm's complete line of 6" x 18" reciprocating table surface grinders with operating features, specifications and dimensions. Accessories also are pictured and described.
Circle Inform-A-Gram No. E6.

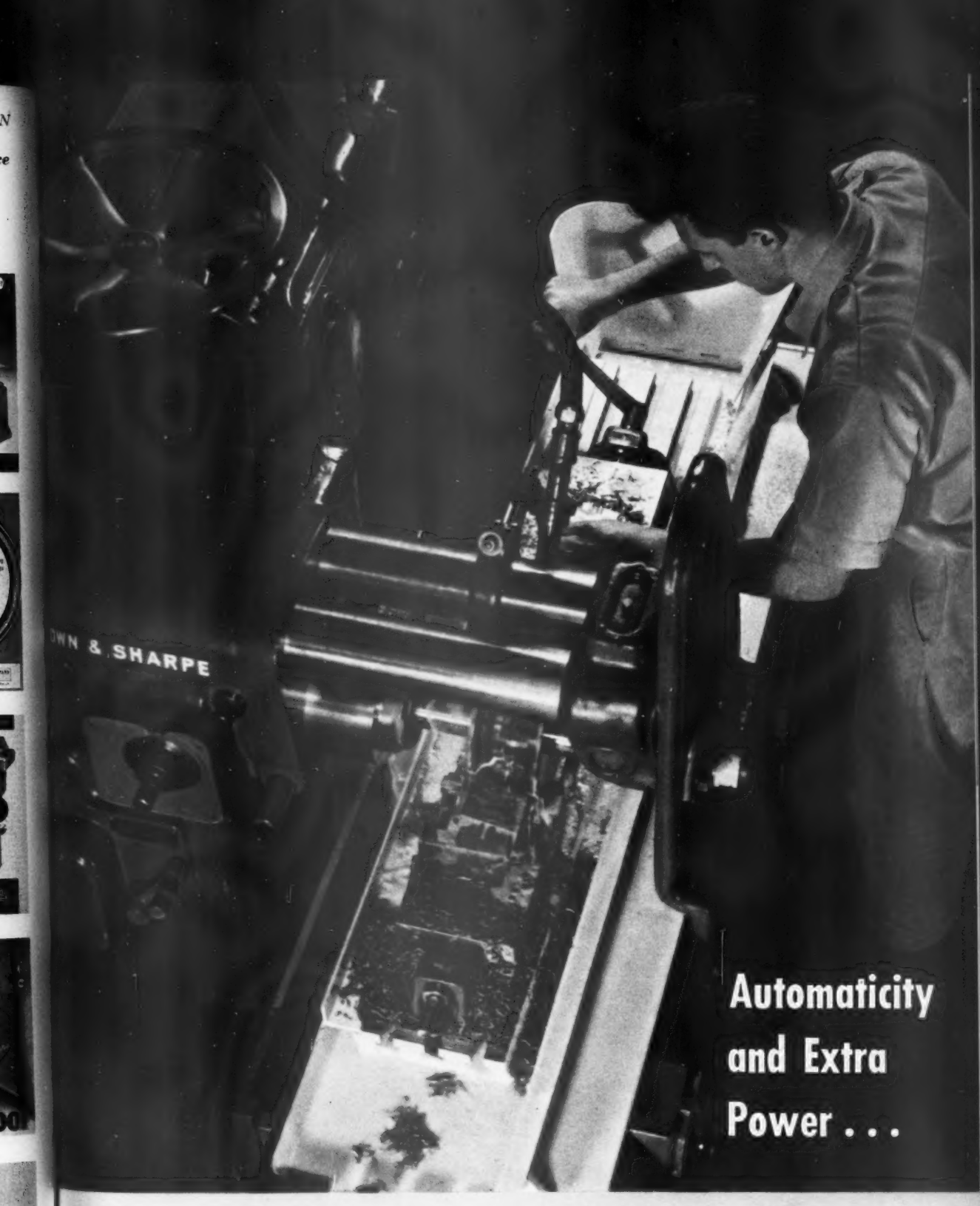
Shop Instrument. Micrometrical Mfg. Co., 345 S. Main St., Ann Arbor, Mich., announces a 4-page bulletin on the Anderometer, a shop instrument for testing assembled ball bearings in production or receiving inspection. The bulletin is available to TOOLING and PRODUCTION readers.
Circle Inform-A-Gram No. E7.

Ex-Cell-O Tool Grinders, for the efficient sharpening of single-point tools—carbides, cast alloys and high speed steels, are featured in this handsome illustrated brochure offered by the Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. It is yours for the asking.
Circle Inform-A-Gram No. E8.

Stressproof, severely cold worked furnaces treated steel bars, are the subject of this brochure which is aimed at being a blueprint to new economies in the use of steel bars.. The well-illustrated booklet is available from the LaSalle Steel Co., 1424 150th St., Hammond, Ind.
Circle Inform-A-Gram No. E9.



Precision Instruments. The first complete presentation of the many precision instruments manufactured by the Chicago Dial Indicator Co., 180 N. Wacker Drive, Dept. A, Chicago 6, Ill., is now available in a fully illustrated colorful 16-page general catalog No. 106.
Circle Inform-A-Gram No. E10.



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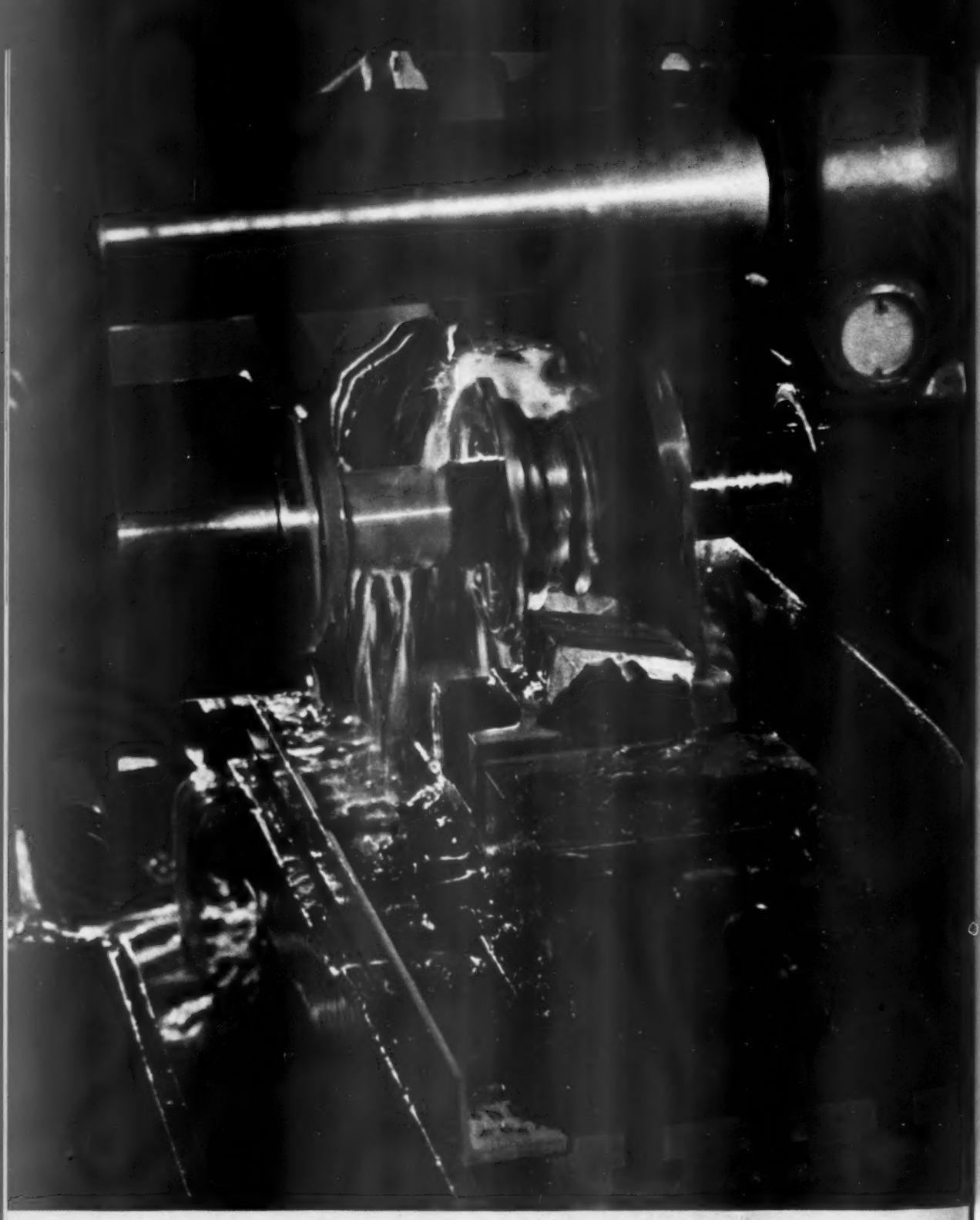

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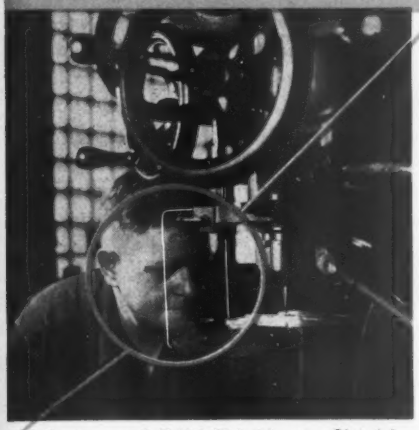

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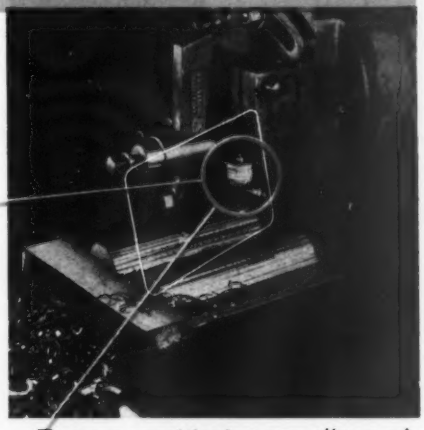

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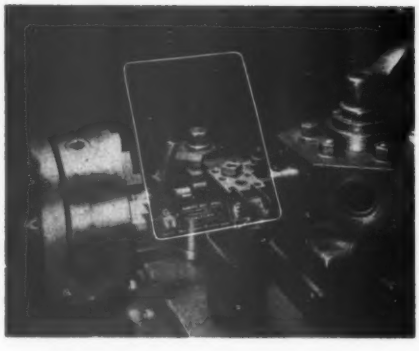

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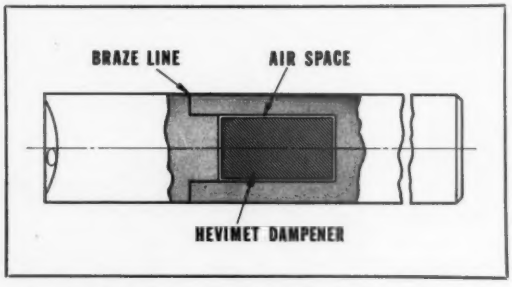


Fig. 3. Dampening weight built into the boring bar or quill, as close as possible to the tool bit end, will eliminate much of the self-excited tool vibration.

. . . Precision Boring, from page 59

4:1. That is, its normal maximum length is four times its diameter. A steel bar having a carbide stiffening core is dependent upon the bar diameter and its effect upon core diameter-to-length ratio to achieve any degree of success. Therefore, it is impossible to state its definite range of use. Solid carbide bars are being used successfully on work parts where length-to-diameter ratios exceed those normally machined with steel bars. Listed below are the hole length-to-diameter ratios obtainable.

Work Part Material	Length-to-Diameter Ratio
Steel	6:1
Cast Iron	6:1 to 7.5:1
Aluminum	8:1 to 10:1
Brass	8:1 to 9:1

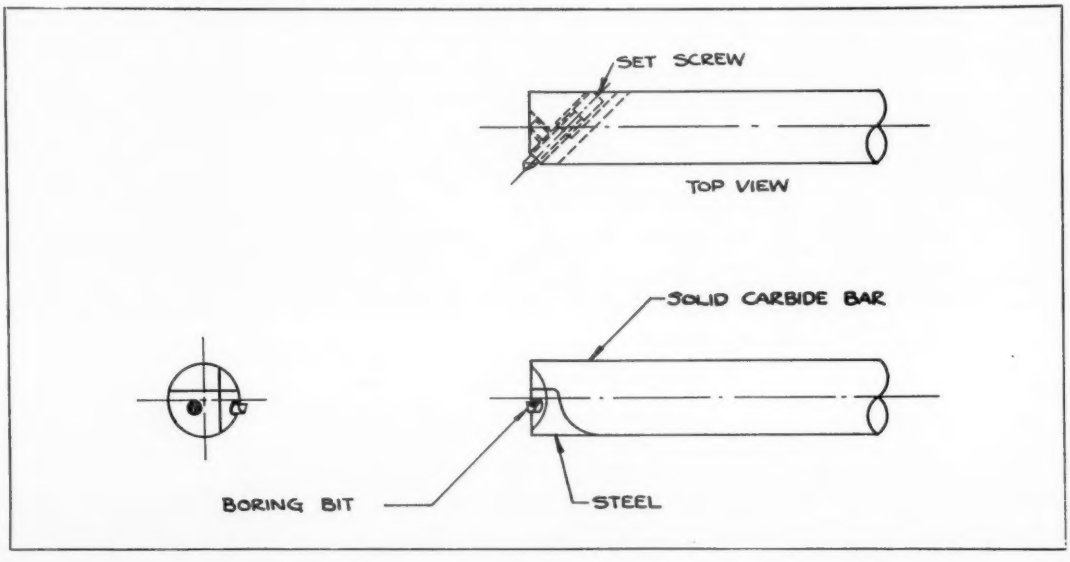
The normal operating range of steel or carbide bars may be extended through the use of built-in vibration dampeners (Fig. 3). The dampener is a tungsten carbide or Hevimet weight that "floats" in a prepared cavity located as near to the outer end of the bar as possible. Slight clearance is provided around the weight to provide an air film. The effect of this loose weight is to dampen out vibrations induced by the tool itself while cutting.

Good boring bar design practice has been established over the years, and there are certain recommended design features where solid carbide bars are used. Bars for holes 5/16 to 1" or larger in diameter should be made similar to that shown in Figure 4. A bar of this type incorporates a removable and adjustable tool bit. Bars for holes less than 5/16" diameter should be made similar to that shown in Figure 5. Here, the tool is brazed to the end of the bar and is not adjustable. This design presents a serious problem when applied to rotating bars but does not adversely affect its application to stationary bars.

It is necessary to provide ample chip clearance when designing a bar so that chip flow is not interrupted. Interrupted chip flow, when using carbide tools, will result in poor finish and broken tools. It is recommended that, whenever possible, boring be done on the outward motion of the tool. That is, pass through the bore on rapid traverse, move the tool into cutting position, and bore on the outward motion. In some blind holes, this would produce a chip removal problem if the hole is of small diameter. However, chips may sometimes be removed by a jet of air. Chip breakers are usually of little value when boring steel due

. . . Continued on page 76

Fig. 4. Typical large solid carbide boring bar, with removable and adjustable solid carbide tool bit held in brazed-on steel insert. Hollow set screws are used for retainment and adjustment of the tool.



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Builders of a precision line of Grinders, Automatic Drill Heads, Tool Post Grinders, Drill Grinders, Light Drilling Equipment, Flexible Shaft Tools, Handgrinders, Fractional hp Motors and Gear Motors.

CIRCLE INFORM-A-GRAM KEY NO. 73

. . . Sliding Sub-Tables, from page 61

tool and as these tools are finish ground the operator will cause most of the wear on the diamond wheel to be at one point. This is due to the excess carbide being removed upon initial contact of the tool with the wheel at the same place. The diamond wheels consequently are grooved or worn out of flat, sketch "C", Figure 2.

For the same reason, grinding chamfers on tools made with sharp corners can be very damaging to diamond wheels. Grinding such tools will also groove the wheel, sketch "D", Figure 2. Using the sliding sub-table and, if necessary, limiting its side travel to cover only the width of the wheel, or slightly more, the operator, due to the sliding ease of motion can approach the wheel and start cutting at any point, sketch "E", Figure 2.

The finish of surfaces and cutting edges of tools ground conventionally on diamond wheels is usually poor. One major reason for this is lack of proper oscillation and the inability of the operator to remove the tool from the wheel while the tool is in motion. His initial approach and return when finish grinding is often jerky and results in a moment when the tool is stationary against the wheel. This causes grind lines on the tool, usually ragged edges, leaves a poor finish and reduces the tool's cutting effectiveness.

Here again, the sliding fixture enables the operator to bring the tool rapidly against the wheel with proper pressure and at the same time to impact a sliding side to side movement. As the tool is finish ground, the operator can readily reduce the pressure of the tool against the wheel and remove it while it is still sliding back and forth. This will result in a finish on the tool which will be better and smoother than a conventionally ground tool. At no time need the tool be held stationary against the wheel and thus grind marks will not mar the finish.

Another major cause for excessive diamond wheel wear is due to run-out. Improper use when grinding tools on a conventional table will result in the wheel running out or "choppy" for its entire life. Although it is common knowledge that all diamond wheels should be indicated to run true to a few tenths, the majority of wheels examined on single point tool grinders reveal that they run out from .001" to .006". There is nothing more damaging to the wheel or destructive of its life.

Run-out is rarely self-corrected by wearing in true during use. The tools cannot be held sufficiently rigid or free from jerky, sudden movements against the wheel. Thus, normal off-hand grinding simply aggravates the condition and run-out continues. Run-out is additionally wasteful in that only one section of the wheel is cutting and wear in this section is excessively fast.

The firm steady pressure and controlled oscillation of the tool against the wheel made possible by the use of sliding fixtures on sub-tables not only will keep the wheel flat but will wear off any high spots very rapidly and result in a smooth, flat wheel running dead true. A flat, true running wheel will grind a finish from 100% to 300% better than when the same wheel is not running flat and true.

The fact that better finishes are made possible by sliding or sub-table fixtures means that such fine finishes as may be specified on a tool print can be attained by the expenditure of less time and labor. Where as the conventional free-hand method would be to finish the tool on a wheel of low diamond concentration and fine particle size, the sliding fixture will enable the operator to attain a fine finish with a wheel of coarser grit and higher concentration. Thus not only is there the saving in time and effort, but the problem of stocking and using different types of wheels is simplified.

There are many instances of small tools or tools of intricate shape being difficult to hold and grind on a conventional grinder.

These jobs can turn out to be time consuming and costly, particularly as there is always the likelihood of incorrect grinding. By means of small fixtures or jigs such as pot chucks, v-blocks, clamps, etc., which can be bolted to the upper plate of a sliding sub-table fixture such "problem" tools can be accurately held and correctly positioned for grinding with a minimum of effort.

The same degree of accuracy of control pertains when very accurate or fussy single point tool shapes, reliefs or fine finishes are required. Where such specifications have been met by using conventional cutter grinding techniques, i.e., holding the tools rigidly in a vise and using diamond cup wheels, the procedure has too often proved to be slow, costly and excessive in diamond consumption. Cup wheels are designed for the light grinding of clearances on round tools, not the large flat areas encountered on single point tools. There is no need to use cutter grinders when sliding fixtures can do the job on a regular off-hand grinder well within the usual tolerance. It has been established that with a sliding sub-table the accuracy of side and end cutting angles and reliefs can be held to ½° or less.

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TODAY TOMORROW INDEFINITELY

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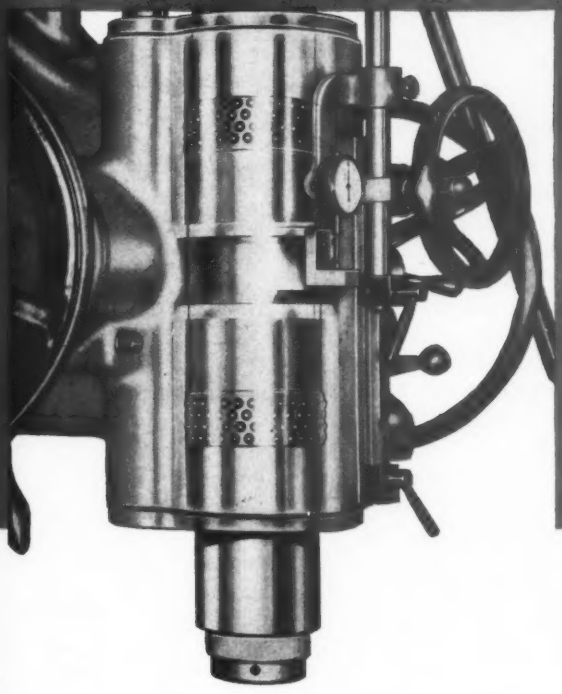

Because OF THE EXCLUSIVE BALL ROLL QUILL

Plus THE FUNDAMENTALLY CORRECT END MEASURE SYSTEM

This construction retains accuracy, permits heavy lateral loads, and reduces maintenance. Two hardened and ground steel liners are deep frozen for setting into the head, and later lapped in place. The spindle is hardened and ground, and then draw polished by hand. Super-precision balls, held in a non-metallic cage, are selected for absolute uniformity. Thermal expansion after assembly preloads the bearings to a total pressure of over 8000 pounds. After lubrication and permanent sealing the quill is ready for use, and then is exceptionally accurate, operates with minimum wear, yet glides smoothly enabling an operator to feel a ⅛" drill feeding in the work.

This system is the basis for all others. Every mechanic knows the instruments thoroughly — precision end measures, inside micrometers, and dial indicators.

Each slide has a built in "zero point" indicator which is set to zero after the table is locked to bore the first hole. To locate the next hole, end measures are inserted for the even inches, the inside micrometer set for the inch fractions (accurate to .0001") and the table moved until the "zero pointer" reads exactly right.

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THE 2 A — practical tool room size — table size 22" x 44".

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MACHINE TOOLS • CUTTING TOOLS • GAGES

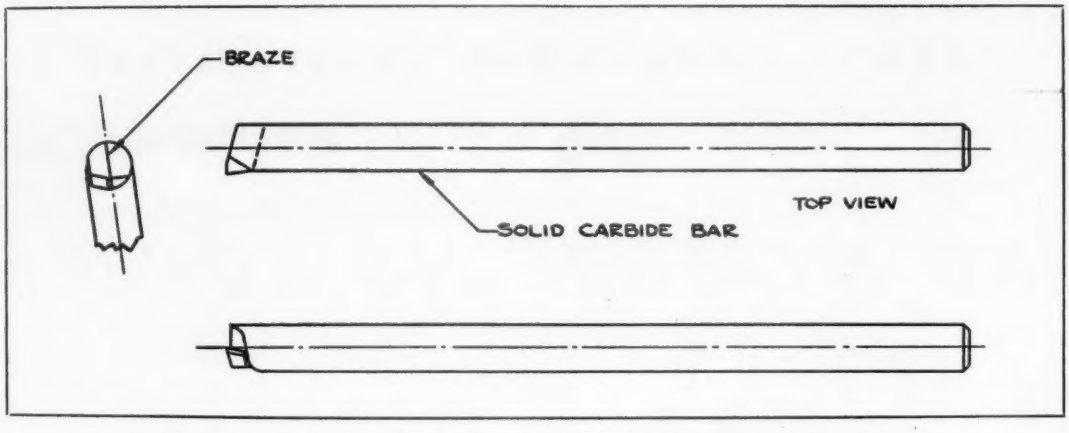


Fig. 5. Typical small solid carbide boring bar, with solid carbide tool bit brazed to the end of the bar. This type construction is commonly used where bar is stationary, but may present balancing problem where bar rotates.

. . . Precision Boring, from page 72

to the light chip produced.

Tool design is of importance and should be considered from the standpoint of only that portion of the tool in the cut. Rake angles and general tool geometry should be studied to suit the condition of the operation to be done. When boring soft materials such as aluminum, it is necessary to lift the chip free from the work surface so that it does not mark the finished surface. A free cutting tool having a 10° to 15° rake parallel to the axis of the bar will usually make the chip flow straight back along the bar.

Tools of this same design but having rakes of 5° to 10° work well on steel. A side cutting edge angle or lead angle should be used wherever possible to provide an easier entrance into the cut. An ample end cutting edge angle should also be provided to relieve the drag on the tool. This will reduce the notching effect of the feed marks on the end of the tool back of the nose. The end cutting edge angle should be from 8° to 15° depending upon conditions.

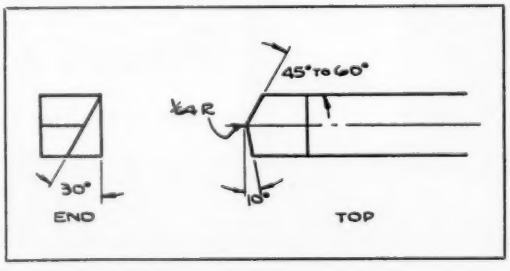
When boring a hole which has a cross hole or slot through it, a condition is encountered which can be serious from the standpoint of surface finish and tool life. Proper consideration given to tool design and speed can usually eliminate most of the difficulties. A tool design such as shown in Figure 6 will provide practically shockless entrance into and exit from the interruption. The tool shown is one which is mounted at right angles to the axis of the bar. A starting point can be recommended for speed determination by not exceeding 375 sfpm on 200 Brinell 1045 steel. As the machinability of the workpiece goes lower, the speed will likewise be reduced.

On interrupted boring, the material being machined can become harder in some cases than the tool material itself under the impact of the interruption. This is due to the work hardening characteristics of some materials. It is important to note that the instant release of tool cutting loads can cause as much damage as the impact loading when entering the cut.

Coolants can be used if needed for reasons such as dimensional control, chip removal, etc. With the light chip encountered in precision boring, it is rather doubtful whether the use of coolants will produce greater tool life. However, if coolants are used, they should be so directed that the stream fully covers the cutting tool. When the boring bars are large enough to permit them, channel holes should be provided through the bar to permit discharging the coolant at the tool.

Precision boring is somewhat like a delicate surgical operation: It can be rewarded with success, but the many items that can cause failure are so numerous it is extremely difficult to maintain perfect control over all of them.

Fig. 6. This boring tool design provides practically shockless entrance and exit, especially in cases where the operation is an interrupted cut. Tool is held at 90° to axis of the bar.



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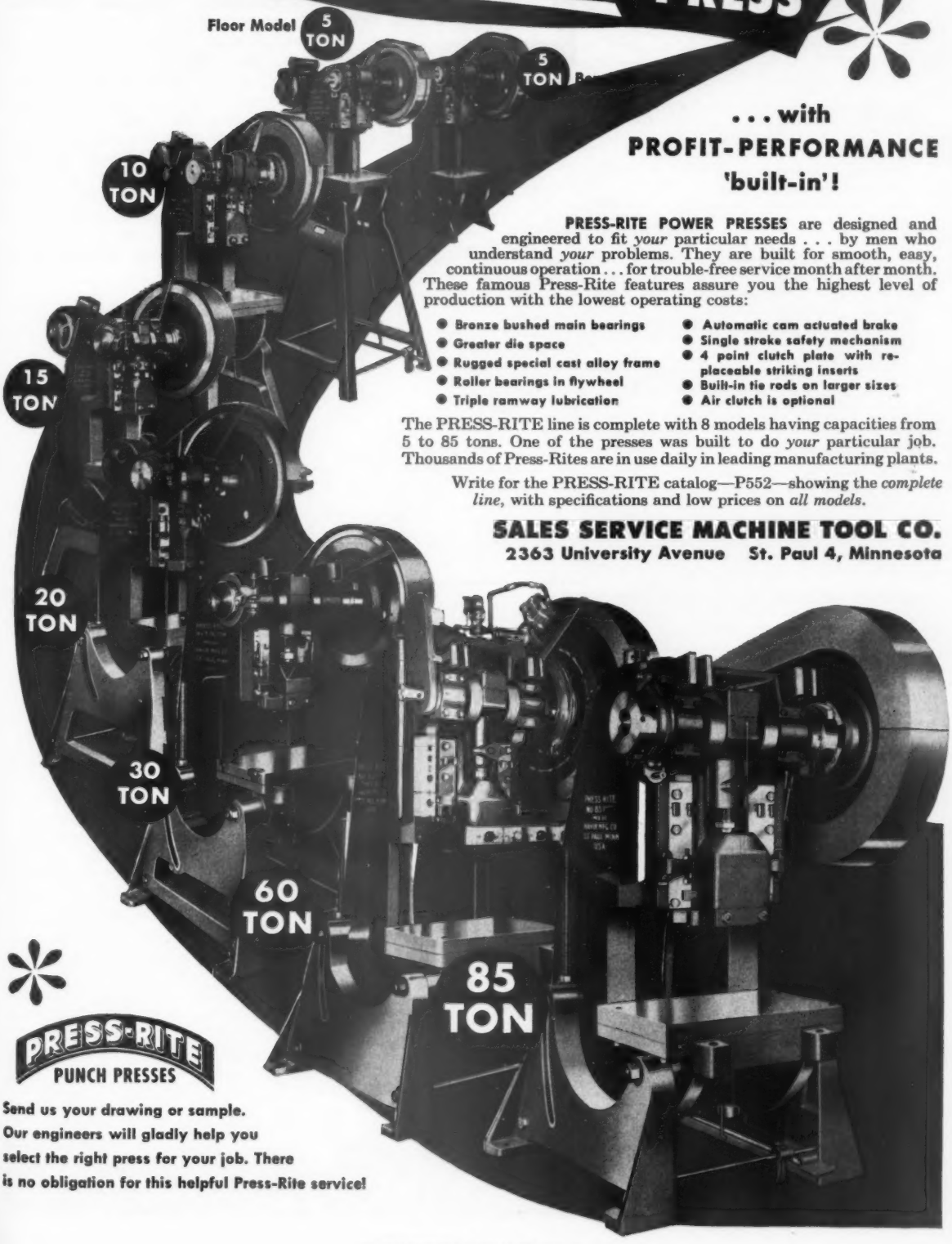

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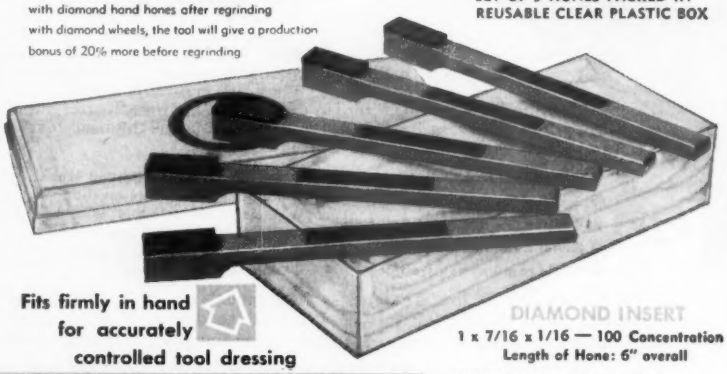

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for all general shop requirements

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No.	SINGLE END	
1	100	$7.50
2	150	
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In lots of 6 sets $5.00 off per set

complete range for all tool cutter finishing

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No.		DOUBLE END	
6	100	320	$13.85
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CIRCLE INFORM-A-GRAM KEY NO. 78

Tungsten Carbide Core Eliminates Boring Bar Chatter

Cemented Tungsten Carbide material has long been known throughout the metalworking industry for its cost savings in tooling and wear resistant applications. However, today it's finding many new and interesting uses such as solid cores within boring bars to eliminate chatter during machining—a problem common to machine shop operators today. A case in point is the recent experience of a prominent company who was machining a

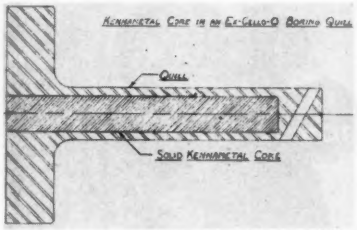


Photo courtesy Kennametal Inc.

Boring quill's solid Kennametal core eliminates chatter during machining. Quill is bored from flange end as illustrated; has 30-degree tool slot, 1-inch axial thickness at its nose. It is shrunk fit over carbide core which is 13/16-inch in diameter by 6½ inches long.

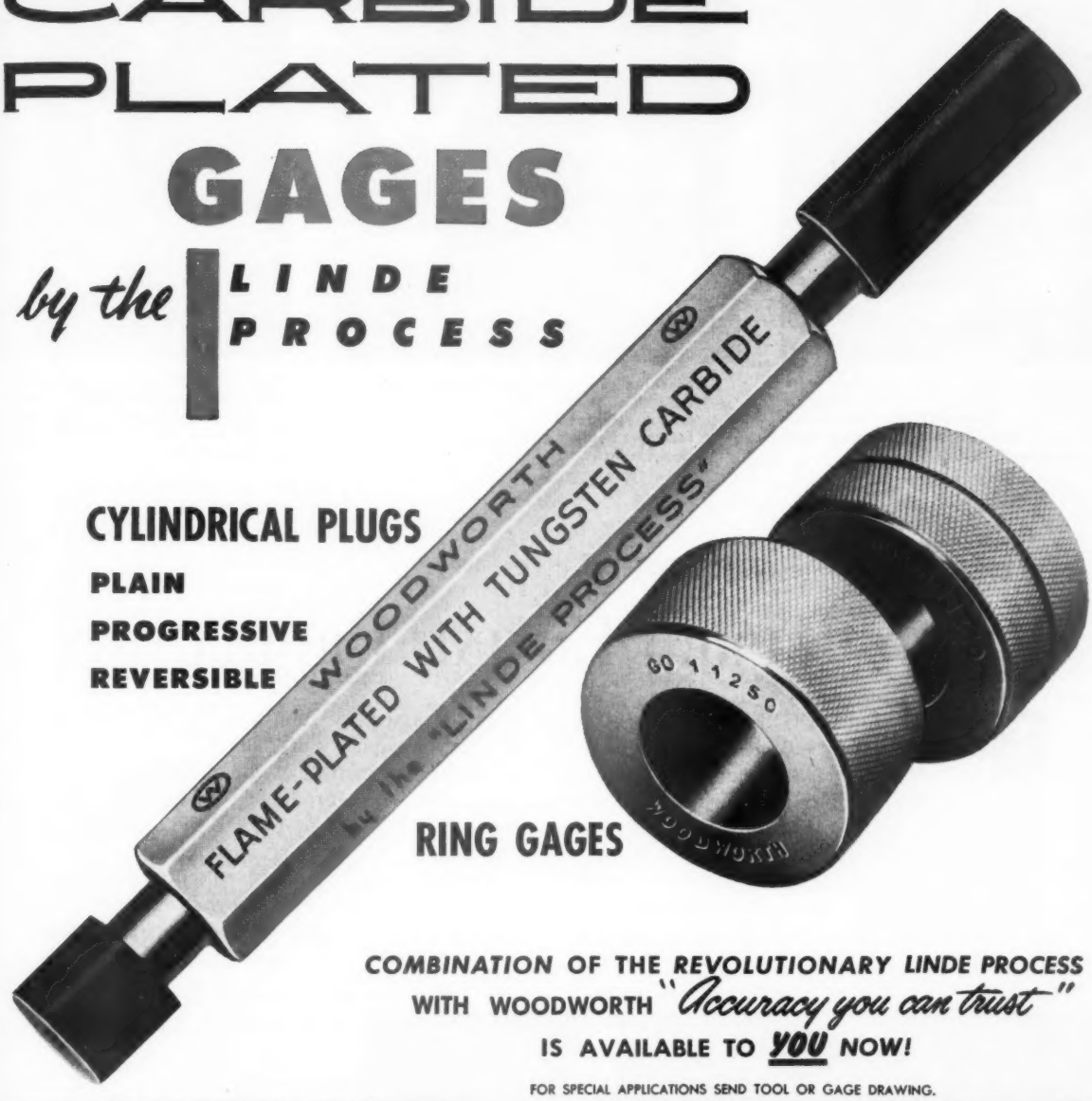
job requiring a bore 1.250-inch in diameter, 5½ inches long in SAE 1010 steel. Operating on this job in a consulting capacity the Ex-Cell-O Corporation's engineering department recommended — to eliminate all chatter — use of a boring bar or quill containing a solid tungsten carbide core. Kennametal grade K-6 worked to perfection due to its extremely high Young's modulus of elasticity—94,300,000 pounds per square inch.

Their new boring quill was bored from the flange end to a depth which was suitable for the tool slot and length of solid tungsten carbide tool. In similar applications throughout industry the depth will of course vary depending upon the length of the quill and the amount of material needed at the quill's nose for a tool slot. In this particular Ex-Cell-O application, the quill had a 30-degree tool slot and re-

. . . *Continued on page 88*

CARBIDE PLATED GAGES

by the LINDE PROCESS



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Machine automatically tightens bolts to proper torque on front cam section of Curtiss-Wright Turbo Compound engine. Later, cam is assembled into crankcase system.

Machine runs down the bolts holding reduction pinion gears to identical torque tightness, and crimps the fasteners holding gears in place on the ring carriers.

Machine assembles inner parts for engine cylinders. The machine locks a spring into place and is then reset to depress it so that the rocker arm can be dropped in.

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SPEEDS TURBO ENGINE PRODUCTION

THE FIRST PROGRESSIVE assembly line to make full use of automatic machinery in the production of aircraft engines, is now in operation at the Wright Aeronautical Division of the Curtiss-Wright Corporation in Wood-Ridge, N. J.

The new line, for putting together Turbo Compound engines used in both military and civilian aircraft, takes 42% less space than the previous assembly line and has an increased production capacity of 250%.

All present models of Turbo Compound engines are being produced on this one line, which can be later adopted to the assembly of newer and more powerful models.

Movement of parts and sub-assemblies between stations is fully conveyorized. Belt, roller, and chain conveyors carry parts from one

. . . Continued on page 171

Powerized conveyor lines carry assembled cylinders and pistons to the operators for installation on the engine. Machines at this station automatically index the master and articulating rods to top dead center for installation of pistons and cylinders.

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(ANSWER NUMBER 3)

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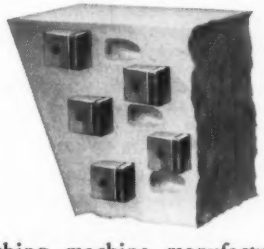
Now, automobile and other manufacturers can keep broach tool inventories at a minimum and be assured of *off-the-shelf delivery* on *standard* Firthite tipped broach tools and almost equally fast service on "standards" modified to suit individual tooling requirements. Firth Sterling broach tools come in three standard sizes and styles.

The addition of broach tools to the constantly expanding line of *standard* Firthite Carbide Tools is the result of close engineering cooperation with one of the major



broaching machine manufacturers, whose huge new broaching machines are playing such an important part in the mass production of cylinder blocks for today's automobile engines.

The outstanding performance record of these Firthite broach tools has resulted in a continuing demand that enables us to make them stock items. Always specify Firthite broach tools for increased production and economical machining.

Prompt delivery may also be had on solid Firthite finishing blades.

Drop us a line for detailed engineering information or literature. P-11

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But for 95% or more of general machining operations, where steel cutting tools are used, you need only TWO grades . . . . Firth Sterling CIRCLE C and VAN-CHIP. These two will handle the widest possible range of general machining work and are recommended by Firth Sterling as all-purpose tools.

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High Temperature Cermets

CIRCLE INFORM-A-GRAM KEY NO. 82

HARDNESS TESTING EQUIPMENT AND METHODS

Continued *

by John E. Hyler

TESTS FOR HARDENABILITY inevitably issue as hardness tests. In regard to the end quench test for hardenability of steel, generally referred to as the Jominy end quench test, different types of specimens are used. These are referred to as preferred, optional, and "type L" specimens. In checking hardness of such specimens, it is important to have a fixture which will not only properly support the piece, but also provide means for accurately positioning the sample for each successive Rockwell hardness test at intervals of 1/16 inch.

To take care of such tests, a special fixture has been developed by a leading manufacturer of hardness testing equipment. It may be quickly and easily clamped securely to the elevating screw by means of a nut. Ground surfaces are provided on this fixture to support the underneath surface of the specimen, so that it does not rock or tip while tests are being made, notwithstanding required moving of the specimen. Accurate spacing of indentations is accomplished by a wheel and handle, which may be located at either end of the fixture.

The arrangement is such that one wheel revolution provides a 1/16" movement of the specimen. A ball click indexing mechanism indicates each 1/16" spacing, so one need pay little attention to scale markings. The specimen is securely held in positive indexed position by spring pressure. The fixture permits tests to be made up to 2½" from the quenched end of the specimen. A scale is provided to indicate positions at which the test is being made, and to facilitate tests at greater intervals than 1/16" if desired.

Under rigorous and continued use, the finest hardness tester may lose something of its high accuracy. In consequence, it becomes necessary to test the tester itself. Where micrometric values such as those handled by hardness testing machines are involved, even a small inaccuracy will make the unit practically useless. Where an old machine, with its penetrators and gauges, has been used by different operators on almost countless tests, it is well to regard it askance unless it is frequently checked to make sure it is in good order.

Machine Testing Devices Employed

Carefully made test blocks are employed in many cases for checking Rockwell testers. Such test blocks are relatively inexpensive.

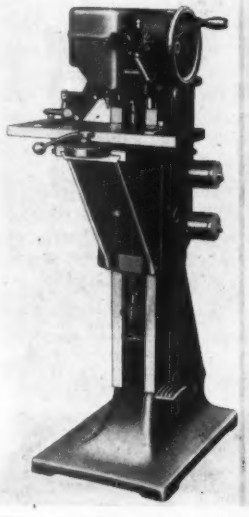

Fig. 1 This highly versatile hardness tester of Vickers type, is used for both laboratory and production testing, and is equipped with an accurately-cut, highly-polished diamond indenter. This indenter makes a square impression in the specimen which can be measured with great accuracy. Errors in reading on this machine are avoided, since the readings appear as actual figures. The load is automatically applied, then automatically removed after a pre-determined period.

Photo courtesy Riehle Testing Machines Division, American Machine and Metals, Inc.

They will reveal whether a hardness testing machine is or is not in good condition, for they are marked with their definite hardness value.

In regard to Brinell hardness testing machines, some provide direct-reading instruments known as Brinell calibrators. This is a direct-reading instrument which will show an error of load in a Brinell machine. A standard calibrator as provided by one manufacturer is gauged for compression loads of 500, 1,000, 2,000 and 3,000 kilograms. Instructions are furnished with these instruments, which are claimed to be superior to the test-block sys-

. . . Continued on page 173

*See page 64, Tooling & Production, December, 1953.

it pays up to 50% to think

FIRST

about last operations

Parker-Kalon Self-tapping Screws have been cutting assembly costs of millions of metal and plastic products for over 35 years. Yet, today, thousands of manufacturers, who could gain the same benefits, still use such slow-down fastening methods as machine screws in tapped holes, bolting, and riveting. Why?

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GET THIS GUIDE TO LOWER ASSEMBLY COST

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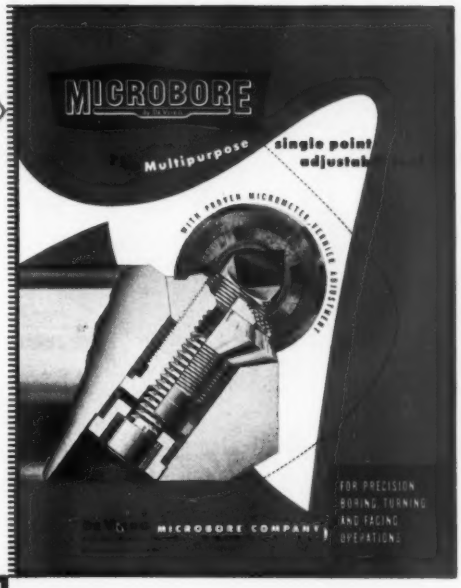
CIRCLE INFORM-A-GRAM KEY NO. 84

DEVLIEG OF DETROIT

brings you a new comprehensive catalog featuring—

Microbore

. . . the multipurpose single point adjustable tool for precision boring, turning and facing operations.

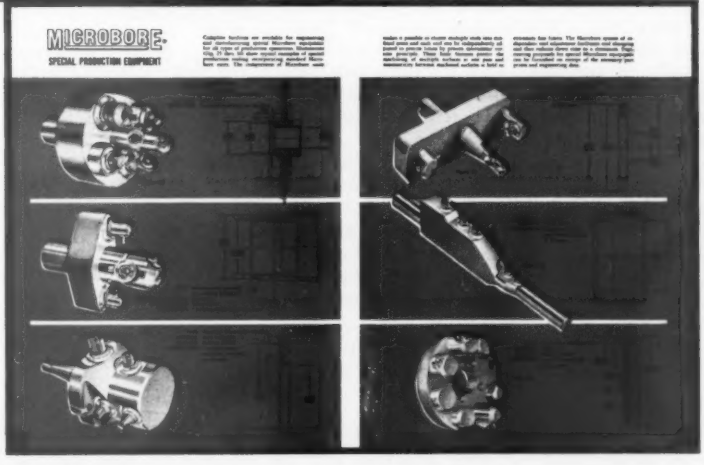


For General Purpose Work:

A wide range of standard Microbore boring bar sets is available for tool work and general purpose boring.

For Production Applications:

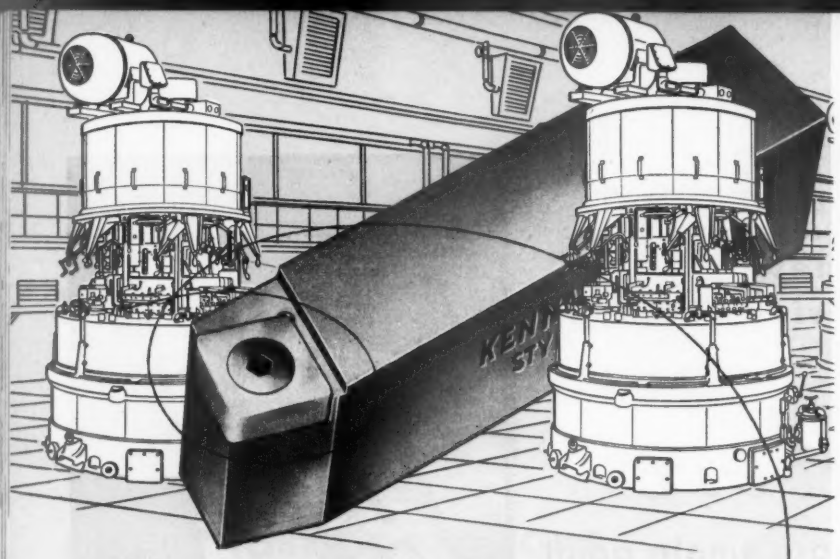
A complete service is available for engineering and manufacturing special Microbore equipment for all types of production operations.



A request on your company letterhead will bring a free copy of this catalog.

DEVLIEG MICROBORE CO. 480 Fair Avenue, Ferndale · Detroit 20, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 85



The Most Critical Point in AUTOMATION

Machine shop automation—the new trend toward automatic conveying, loading, cutting, unloading, and transferring of workpieces—promises great gains in productivity, but it must have cutting tools designed for the operation.

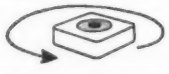
Two features are essential in cutting tools for automation: (1)Durability which enables operation to be sustained with minimum stoppage for tool changing, and, (2)precision-ground, pre-set, multiple-edge tools which permit quick changing when necessary.

Kendex "throw-away" inserts —an exclusive Kennametal development—have both features. Made of Kennametal, they have its high hardness and wear-resistant properties for great durability. Screw-mounted, they can be quickly rotated, in seconds, to new cutting positions. No grinding is required—the insert is thrown away after all cutting edges have been used and quickly replaced with a new preground "button" ... round, square, or triangular as required.

Our engineers, in on the ground floor of automation, have cooperated in developing and applying Kendex, Kennamatic,* and other types of Kennametal tooling to its requirements. The features of this tooling may be the solution to reducing machining and tool maintenance costs—on any operation—in your shop. Ask your Kennametal tool engineer how you may apply it to advantage. Kennametal Inc., Latrobe, Pa.

KENDEX* tooling keeps AUTOMATION IN ACTION!

1. Hard, strong, wear-resistant Kennametal is molded into square, round, or triangular Kendex inserts, which are precision ground.



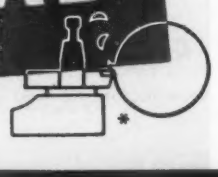
2. Kendex inserts are mounted to suitable holder with socket head screws. When edge becomes dull, insert can be turned, in seconds, to new cutting position.

- *MINIMIZE* downtime for tool changing—a major cause of unprofitable operation.
- *ELIMINATE* tool grinding expense—Kendex inserts are not ground; simply thrown away when all cutting edges have been used.

*Registered Trade-Marks

KENNAMETAL

CEMENTED CARBIDE TOOLING THAT INCREASES PRODUCTIVITY



SALES OFFICES IN PRINCIPAL CITIES

B-5

G. E. Building Control For

A record-playback control which directs a machine or process cycle from information stored on a magnetic tape is being built by the General Electric Company's Specialty Control Department for the Giddings and Lewis Machine Tool Company, Fond du Lac, Wis., it was announced recently.

The automatic control, in development at G. E. for five years, is expected to double the production speed of a milling machine that manufactures self-reinforced "skin" structures for jet aircraft, according to Giddings and Lewis engineers.

The industrial-type multiple-channel tape recorder used in the control is similar to equipment employed in the entertainment and broadcasting fields, except that it records motion instead of sound. It will serve as a magnetic memory for the machine on which it is installed.

G. E. expects to deliver the control to Giddings and Lewis so that the completed skin milling machine can be demonstrated to aircraft manufacturers early next year.

In operation, a skilled machinist or tracer control runs the machine through a series of motions to produce the first piece of work. These motions are translated into electrical signals by means of selsyns and are recorded on the magnetic tape through an electronic circuit. Non-productive motions such as tool setting, gauging, template changing and stop settings are not recorded.

When the tape is played back through the machine it automatically duplicates the machine's original motions and produces a part identical to the one made while recording. Repeat orders can be produced economically by taking the specified tape recording from a file and inserting it into the control.

Research studies are now being conducted by Giddings and Lewis into the possibility of using an electronic computer to convert numerical data into the electrical signals recorded on the

Record-Playback Giddings & Lewis

magnetic tape. This would eliminate the first manual machining operation.

While the record-playback control may be used in many applications other than the skin milling machine, G-E engineers point out that the control must be individually engineered to suit each installation and carefully co-ordinated with the design of the machine it is to control. In addition, the equipment is relatively expensive, so possible applications are eliminated by economic considerations.

Essentially, any motion or control that can be operated from an electric signal can be operated from the record-play-back control.

In the machine-tool field, a representative list of possible applications includes milling machines, die-sinking machines, flame cutters, and others. Record-play-backs also can be applied to such tasks as opening and closing valves, modulating fluid flow, operating hydraulic and pneumatic controls, and controlling temperature, pressure, humidity, weight, visual density of fluid, conveyor speed, and so forth. Simulated testing—recording in the field and playingback in the factory—is another application of the control.

Compactness of the magnetic tape makes it the ideal storage medium for machine and process cycles, since expensive, bulky master patterns and templates are unnecessary.

The length of cycle that can be controlled depends on the diameter of the reel of tape and the speed at which it is recorded and played back. On the Giddings and Lewis machine a standard 14-inch diameter reel is expected to run a one-hour cycle.

When desired, recordings can be erased easily, restoring the tape to its original condition for a new recording. The tape may be cut and new sections spliced in if only part of the work cycle has to be changed. There is no deterioration of the signal when the tape is stored and play-backs up to 10,000 times are possible

. . . *Continued on page 124*

What's in this NAME?

KENDEX*

It's the Trade-Name for Multiple-edge, Indexable, Tungsten Carbide Insert Tools Produced by Kennametal Inc.

EXCLUSIVE FEATURES

1. *Made of Kennametal*—Kendex inserts have its uniform high hardness and exceptionally long life.
2. *Multiple, precision-ground cutting edges*—enabling a clean, sharp edge to be kept against the work continuously.
3. *Screw-mounted*—can be accurately indexed to a new cutting position, in seconds, without removing tool shank from holder.

OPERATING ADVANTAGES

1. *Minimize downtime for tool changing*—major cause of high-cost operation.
2. *Eliminate tool grinding*—no regrinding; Kendex inserts are thrown away when all cutting edges have been used.
3. "Balanced" tool budget—it's penny-wise and pound foolish to "save" money by excessive reconditioning of old tools, when you can keep new cutting edges on the job continuously with Kendex inserts.

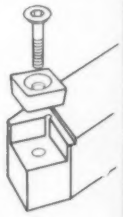
Ask your nearest Kennametal representative for details. Kennametal Inc., Latrobe, Pa.

How KENDEX* Works

1

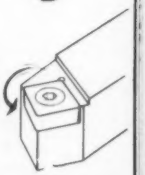
Hard, strong, wear-resistant Kennametal is molded into square, round, or triangular Kendex inserts, which are precision ground.

2



Kendex inserts are mounted to suitable tool holders with socket head screws.

3

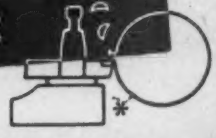


When edge becomes dull, insert is turned to new cutting position. When all cutting edges have been used, insert is thrown away; no regrinding.

*Registered Trade-Marks

KENNAMETAL

CEMENTED CARBIDE TOOLING THAT INCREASES PRODUCTIVITY



SALES OFFICES IN PRINCIPAL CITIES

A-3

HACK SAWS — BAND SAWS

BARNES ROCKET

POWER and HAND HACK SAWS ARE IN DEMAND FOR PRODUCTION CUTTING

GRADIENT HARDNESS

1. HIGH SPEED STEEL
2. FLEXIBLE—TOUGH
3. SAFE—SHATTER-PROOF
4. MEETS EVERY SHOP TEST
5. FOR ALL-PURPOSE CUTTING

A blade demanded for production cutting, Barnes exclusive GRADIENT HARDNESS makes the Rocket a safe, flexible blade—has hard teeth and semi-hard back—stands sudden accidental twists without shattering. Call your Distributor and try them yourself.

Call YOUR INDUSTRIAL DISTRIBUTOR

W. O. BARNES CO., INC.
1287 TERMINAL AVE., DETROIT 12, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 88

. . . Carbide Core, from page 78

quired an axial thickness of 1-inch at the nose. Diameter of the bore was such that the wall thickness was 3/16-inch. Enough stock was left in the bore to permit a shrink fit on the solid carbide core, which in this case was 13/16-inch diameter by 6½ inches long, extending to the back face of the flange, as shown in the sketch.

When this new quill was put into use all chatter was eliminated. Different feeds and speeds were tried but still no chatter occurred. Following this successful application they applied the same principle to three other bars of a similar size—all of which have proved exceptionally successful in operation.

Billet Becomes Bullet

WHICH WAY DID IT GO?

Work Goes 'That-a-way' After Meeting Carbide

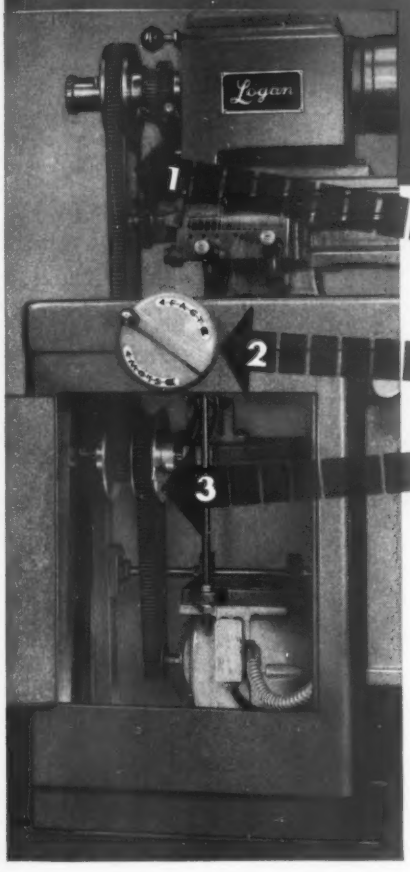
Ordinarily it's the work that throws the cutting tool for a loss. But here is one time where a carbide tool turned the tables - - - it threw the work.

In this case, instead of the tool breaking off as it dug in on a ¾-inch cut on a steel forging, the steel forging itself—weighing about 40 pounds—was catapulted out of the machine like a rifle projectile and landed 30 feet away.

It seems the 28-inch chuck holding the work wasn't sturdy enough to hang on to the 5-inch billet, and the operator underestimated the tool since he never bothered to use the tailstock.

Thus, members of one concern taking a crack at Carboloy's new carbide grade 370 got the surprise of their life. And at the same time, they learned that good machining practice is never to be ignored—especially in the interest of safety.

VARIABLE SPEED DRIVE NOW OPTIONAL ON... Logan 12" SWING LATHE At No Extra Cost



No. 2955-V
12" Swing Lathe with
Variable Speed Drive

Principal Variable Speed Drive Parts

1 Upper Section showing spindle V-pulley and Vari-Speed belt.

2 Vari-Speed Control

3 Lower section, showing Variable Speed V-Pulleys and Vari-Speed belts.

Belts are easily replaced. Spindle Speed Chart on gear guard provides clearly marked settings for various speeds.

SEE IT AT YOUR LOCAL LATHE DEALER'S, OR

Write for Information...

Full catalog descriptions and price information on request. WRITE TODAY TO

Provides Infinite Spindle Speeds, 38 to 1575 rpm.

The rugged, accurate Logan 12" Lathe is now available with either standard V-belt Drive, or the new Logan Variable Speed Drive, *at the same economical price.* Where the work handled requires a variety of spindle speeds, the time-saving speed correction of the Logan Variable Speed Drive definitely reduces costs. On large diameter facing, for example, the optimum surface speed is maintained by simply turning the Variable Speed Control Handle as the cutter goes into the work. No need to stop the lathe. No belt shifting. One control handle provides infinite spindle speeds between 38 and 1575 rpm, with all speed changes made *while the lathe is running.* This new optional feature, together with such standard Logan advantages as the massively proportioned ball bearing spindle; the balanced bed with the two V-ways and two flat ways precision ground; and the convenient new carriage . . . make the 12" Logan the lathe for profitable work.

Brief Specifications of Logan 12" Lathes

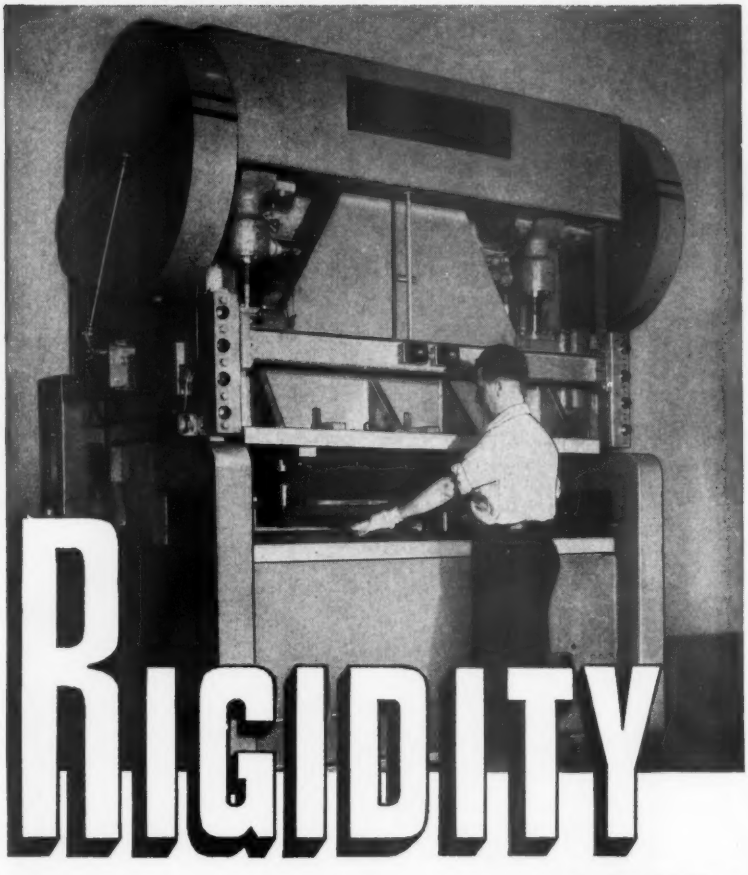
Swing over bed and saddle wings, 12"... Center Distances, 23" and 35"... Turret Lathes Models have 43" bed length... 1⅜" spindle hole... 1" collet capacity... 16 standard V-belt drive spindle speeds, 35 to 1230 rpm... Variable Speed Drive Models, infinite spindle speeds from 38 to 1575 rpm.

LOOK TO LOGAN FOR BETTER LATHES AND SHAPERS

LOGAN ENGINEERING CO.

Lawrence and Lamon Avenues • Chicago 30, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 89



RIGIDITY

AND WIDE BED AREA MAKE THE BATH PRESS TYPE BRAKE IDEAL FOR BLANKING... PIERCING... SHALLOW DRAW

THE RIGIDITY of the Bath Press Type Brake is evidence of its high standard of construction. With speeds of 45 or 60 strokes per minute, it has many outstanding advantages such as Overload Protection, Pneumatic Clutch-Brake, End Feeding, Serial Operation etc.

The one piece welded frame, with closed side housings, makes for perfect die alignment, which means stamping, bending etc. to very close measurements. Slide areas are large, about four times those in ordinary bending presses, adequate for most of the difficult blanking, stamping and punching operations. Ram and bed working areas are flush with the forward housing and easily reached by the operator.

Under a heavy production schedule the efficient and economical operation of the Bath Press Type Brake increases production and offsets losses incurred elsewhere.

For further information and specifications on the Bath Press Type Brakes write for this catalog

THE CYRIL BATH COMPANY

MANUFACTURERS of METAL FORMING MACHINERY

32380 AURORA ROAD . . . SOLON, OHIO

(Located n the Greater Cleveland Area)

CIRCLE INFORM-A-GRAM KEY NO. 90

Carbide Tipped Gun Drills for Deep Hole Drilling

Gun Drills are special tools designed to produce round, straight and deep holes and derive their names from their original use, that for producing gun barrels.

Two types of Gun Drills — solid high speed body and oil tube body type are made by a Plymouth, Mich. manufacturer. Both are carbide tipped. The

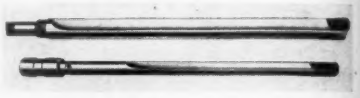


Photo courtesy Whitman & Barnes.

solid high speed body type is used successfully when the hole is comparatively shallow. The oil tube type is used when the hole to be drilled is very deep. In both cases, oil under pressure is used to cool the cutting lip and force the chips out of the hole.

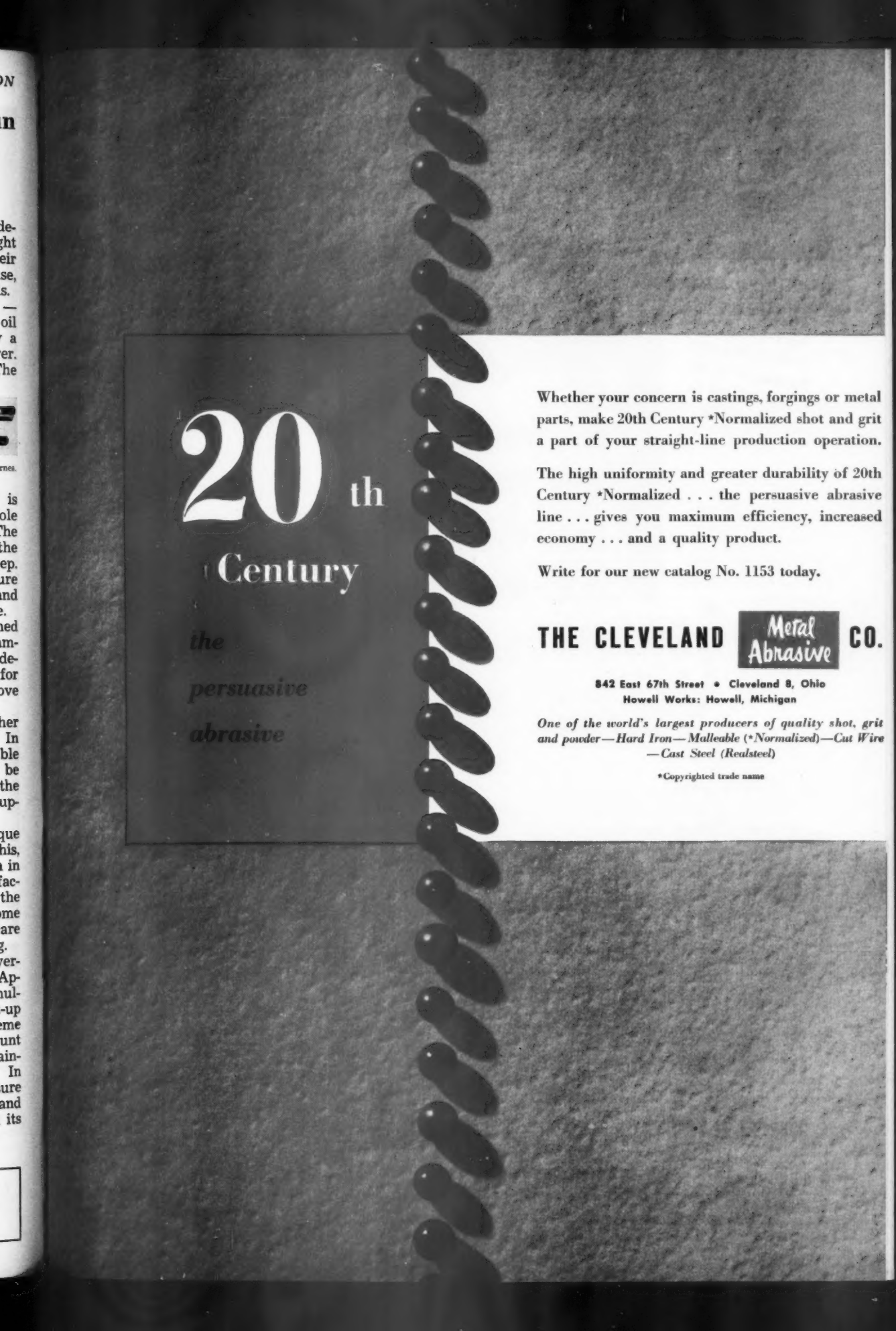
Deep holes are determined by the relation of drill diameters to the depth of hole desired. Gun Drills are used for hole depth of from 4 to above 250 times the diameter.

It is practical to revolve either the drill, or the work piece. In some instances, it is reasonable to revolve both. Oil can be forced through the end of the shank or the side, depending upon the machine in use.

A Gun Drill takes its torque on one cutting lip. Due to this, much attention must be given in the original design and manufacture of the cutting lip of the drill. After the drill has become dull, an equal amount of care must be used in resharpening.

These drills can be used in vertical or horizontal positions. Application can be singular or multiple, depending upon the set-up in the machine. In extreme overall lengths, a great amount of care must be given to maintain constant oil pressure. In some cases it is the oil pressure which maintains the rigidity and the accuracy of the drill and its performance.

BUY BONDS

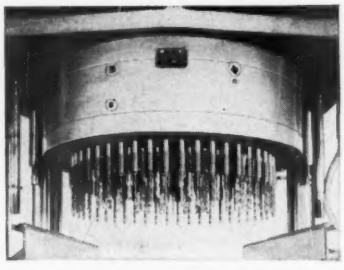

20th Century
the persuasive abrasive
Whether your concern is castings, forgings or metal parts, make 20th Century *Normalized shot and grit a part of your straight-line production operation.
The high uniformity and greater durability of 20th Century *Normalized . . . the persuasive abrasive line . . . gives you maximum efficiency, increased economy . . . and a quality product.
Write for our new catalog No. 1153 today.
THE CLEVELAND Metal Abrasive CO.
842 East 67th Street • Cleveland 8, Ohio
Howell Works: Howell, Michigan
One of the world's largest producers of quality shot, grit and powder—Hard Iron—Malleable (*Normalized)—Cut Wire—Cast Steel (Realsteel)
*Copyrighted trade name

Packard, Too, Uses Zagar
ENGINEERED DRILLING
IN STANDARD ZAGAR DRILLING MACHINES

Zagar's Exclusive, Rigid 4-Post Construction Permits Hundreds of Holes to Be Drilled in RECORD TIME!

Zagar engineering brought down the time of drilling this part from three hours to seven minutes.

This jet engine part suggests the almost unlimited possibilities in drilling hundreds of holes at one pass. Zagar 4-post machines are built around interchangeable gearless drillheads. Any number of holes on all centers can be drilled as close as twice drill diameter in any material. Zagar's 4-post machines achieve heavy duty, multiple-spindle, close center drilling. . . with greater horsepower and thrust, with better alignment and accuracy, with less breakage of *small drills*. . . Let our engineers calculate your savings by demonstrating the Zagar method.



Zagar Interchangeable Drillhead.

★ ★ ★

Write for Catalog T-2
Letterhead requests, please.

ZAGAR TOOL, INC. 24000 LAKELAND BLVD. CLEVELAND 23, OHIO

Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY
ZAGAR TOOL, INC.
24000 LAKELAND BLVD.
CLEVELAND 23, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 92

New Furnace Revolutionizes Rod End Heating

Using production figures based on heating a 4" end-section of ½" rod—a new "Hot Rod" end heating unit brings the rod to 1900° F., in 50 seconds, with an hourly production of 900 rods on the model illustrated. Similarly, a ¾" rod reaches the same temperature in 75 seconds with hourly production of 600 rods. Designed with conveyor and automatic hopper feed, it handles stock sizes of rod from ¼" to 1½" diameter, with varying number of burners to satisfy the particular stock and production to be handled. Length of section heated may be up to 4".

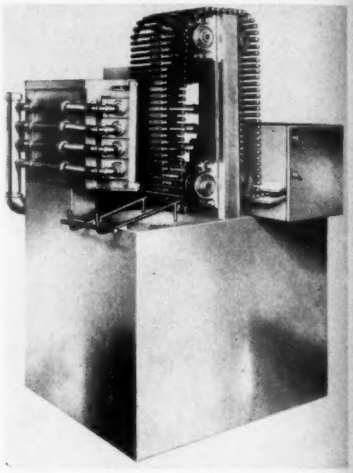


Photo courtesy Gas Appliance Service, Inc.

This new "Hot Rod" unit is ideally suited for rod end heating for upsetting, bolt heading, swaging, localized hardening, etc., with a noteworthy saving in production time and cost.

New Line of Swedish Carbide Tipped Tools

An extensive line of tungsten carbide-tipped, metal-cutting tools, blanks and inserts trademarked SANDVIK "Coromant", is now being distributed in the U. S. and Canada. The line includes a wide variety of turning, boring, facing, threading and grooving tools, cutters, drills, reamers, scrapers, copying lathe tools, Swiss-type automatic tools.

. . . *Continued on page 98*

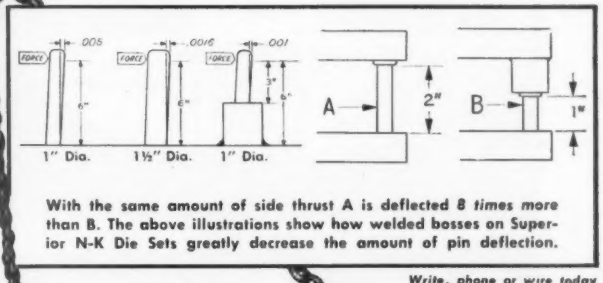
Accurate Die Alignment Reduced Die Maintenance

with

SUPERIOR N-K* DIE SETS

OVERCOME FORCES THAT CAUSE A DIE TO SHEAR ITSELF, CHIP ITS CUTTING EDGES, BREAK PUNCHES, PRODUCE IRREGULAR BREAK LINES, AND CAUSE LARGE AND IRREGULAR BURRS ON THE PARTS PRODUCED.

Superior N-K Die Sets incorporate welded bosses around pins or bushings to increase the accuracy and durability of the die set. These welded bosses shorten the unsupported pin length which in turn greatly reduces pin deflection. Misalignment caused by press irregularities, irregular forces and thrusts within the die itself are minimized, because N-K Die sets bring the pivot point down to or below the cutting plane.



With the same amount of side thrust A is deflected *8 times more* than B. The above illustrations show how welded bosses on Superior N-K Die Sets greatly decrease the amount of pin deflection.

Write, phone or wire today for complete FREE information, on Superior N-K Die Sets.

5 TON SUPERIOR N-K DIE SET

FOR FAST LOCAL SERVICE CALL THESE SUPERIOR REPRESENTATIVES

Kalamazoo, Mich., Phone 5-7988
Indianapolis, Ind., BRoadway 5668
Chicago, Ill., RAndolph 6-8871
Dallas, Tex., Riverside 5138
Syracuse, N. Y., 2013 James St.
Rockford, Ill., Phone 3-3991
St. Louis, Mo., Lucas 1223
Milwaukee, Mitchell 5-6027
Dayton, Ohio, Hemlock 6209
Atlanta, Ga., ATwood 7771
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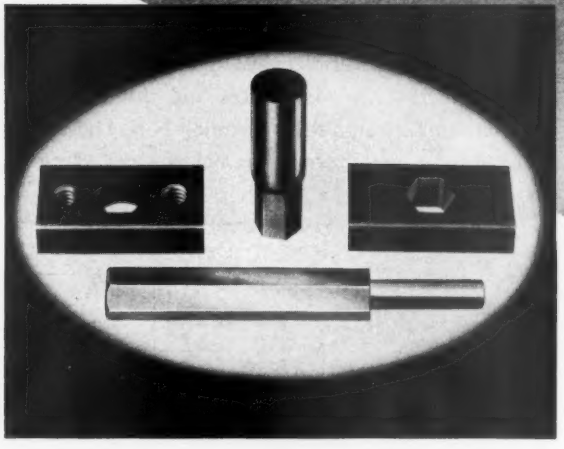
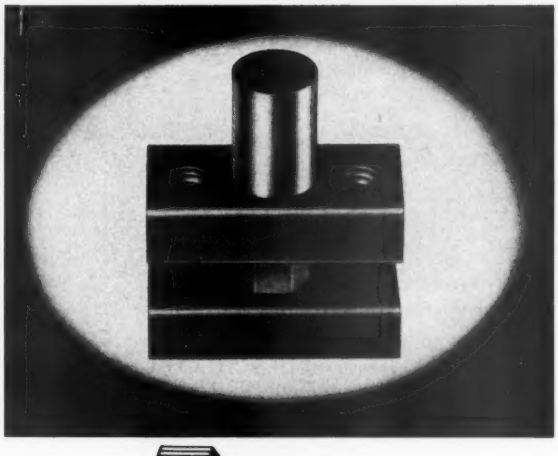
Eau Claire, Wis., Phone 2-3483
Cleveland, O., KEnmore 1-2015.

Can You Make This Punch, Die and Stripper Plate Out of Tungsten Carbide for



$35.50*



In Your Plate

*Electrode manufacturing time	2 hours
Cutting time on die	½ hour
Cutting time on stripper	½ hour
Cutting time on punch	½ hour
Accumulated setup time	1 hour
TOTAL LABOR TIME:	4½ Hours
Cost of Tungsten Carbide material:	$22.00

elox ◀ we will show you how

corporation of michigan

734 N. ROCHESTER RD. • CLAWSON, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 94

Use postage-free Inform-A-Gram Key Number Card for your request

The Newest Aid to users of fasteners is a handy rivet selector offered by the Milford Rivet & Machine Co., Bridgeport Ave., Milford, Conn. It shows various tubular and split rivets, part catalog number, normal clinch allowance, size of clearance hole in work and other informative data.
Circle Inform-A-Gram No. C1.

This Fixture Clamps & Details Catalog contains an exhaustive listing of the very complete Morton Machine Works line. It also includes a handy and practical section for de-

signers and draughtsmen in the form of a tracing template for each item. The address is Morton Machine Works, 2421 Wolcott St., Ferndale 20, Mich.
Circle Inform-A-Gram No. C2.

A New Addition of the Besly Tap Reference Booklet containing latest information on British-American unified thread standards is now being offered by the Besly-Welles Corp., Beloit, Wis. The booklet gives a practical, easy-to-understand explanation of the new standards for internal threading, including a tabulated comparison between Unified Thread forms and American standard threads. In addition, it has data on tap-drill sizes, selection of taps for various classes of work and kinds of material, feeding speeds, how to sharpen taps, types of coolants and screw thread terms and definitions.
Circle Inform-A-Gram No. C3.

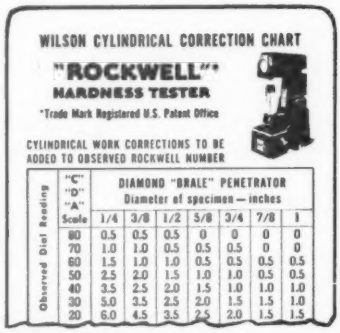
SILICON CARBIDE

Here is a 52-page brochure disclosing the properties of silicon carbide as related to uses other than as an abrasive. The material possesses some unusual physical and chemical properties and is finding increasing use in the manufacture of a number of completely different types of products. The booklet explaining all this can be obtained from the Carborundum Co., Niagara Falls, N. Y.
Circle Inform-A-Gram No. C4.

Conveyors—Terms & Definitions. In this book conveyors are defined by what they are rather than the work they do. The purpose of the manual is to formulate definitions and terms which would, if adopted generally, come to have the same meaning to all who might use conveyor equipment. The book is available from the Conveyor Equipment Mfg. Association, One Thomas Circle, Washington 5, D.C. at a price of $1 per copy.

Broaching Check Points. This 8½ x 11 2-color wall chart gives broach trouble-shooting and gear shaving check points. It is offered by the National Broach & Machine Co., 5600 St. Jean, Detroit 13, Mich.
Circle Inform-A-Gram No. C5.

Correction Chart. The Wilson Mechanical Instrument Div., American Chain & Cable Co., Bridgeport 2, Conn., announces the publication of


WILSON CYLINDRICAL CORRECTION CHART
"ROCKWELL"*
HARDNESS TESTER
*Trade Mark Registered U.S. Patent Office
CYLINDRICAL WORK CORRECTIONS TO BE ADDED TO OBSERVED ROCKWELL NUMBER

Observed Dial Reading "C" "D" "A" Scale	DIAMOND "BRALE" PENETRATOR Diameter of specimen — inches						
	1/4	3/8	1/2	5/8	3/4	7/8	1
80	0.5	0.5	0.5	0	0	0	0
70	1.0	1.0	0.5	0.5	0.5	0	0
60	1.5	1.0	1.0	0.5	0.5	0.5	0.5
50	2.5	2.0	1.5	1.0	1.0	0.5	0.5
40	3.5	2.5	2.0	1.5	1.0	1.0	1.0
30	5.0	3.5	2.5	2.0	1.5	1.5	1.0
20	6.0	4.5	3.5	2.5	2.0	1.5	1.5

its new cylindrical correction chart for rounds. It is made of tough celluloid and measures a convenient 2½" wide by 5¼" long.
Circle Inform-A-Gram No. C6.

A Tool Steel Selection Chart which gives small shops a "desk drawer metallurgist" is available from the Crucible Steel Co. of America, 405 Lexington Ave., 17, N. Y. It answers the questions of exactly what type of tool steel should be used for about 95% of all machine tool operations. It is an invaluable addition to the tool or die maker's tool box, designer's instrument set and engineer's reference library.
Circle Inform-A-Gram No. C7.

A Carbide Reamer Sharpening Shop Manual has been issued by The Staples Tool Co., Cincinnati 25, Ohio, to provide TOOLING and PRODUCTION readers with valuable data on chamfer sizes, recommended clearance angles, method of repairing O.

D.'s and flute faces and special sharpening techniques for specific applications. Sharpening set-ups are fully illustrated with both photographs and sketches. Also included is information on recommended diamond wheel type and sizes and a tabulation of sharpenings for reaming most materials.
Circle Inform-A-Gram No. C8.

"An Introduction to Clad Metals" is a pocket-sized booklet offering a comprehensive survey of the manufacture and applications of the stainless, copper, brass and other Clad steels produced. It is profusely illustrated and shows the basic equipment and processes used in varied cladding methods. The booklet is obtainable from the Superior Steel Corp., Carnegie, Pa.
Circle Inform-A-Gram No. C9.

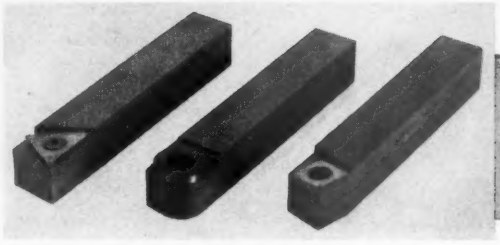


Fig. 3. Kendex button tools, employing throw-away carbide buttons.

. . . Automation, from page 63

Boring cuts and many multiple-tool turning operations cannot accommodate the Kennamatic design. For these jobs, another indexable insert tool has been developed and tested on automation setups. It is called a Kendex insert and comes in round, square, triangular, and other indexable shapes. The insert is a precision ground Kennametal button with a center hole so that it can be screwed onto a tool shank or a tool block. It is indexed as each cutting edge becomes dull, and then thrown away after all edges are used. These low cost, throw-away buttons eliminate all regrinding; and, with their simplicity of indexing, tool changing is reduced to the simple operation of indexing a button. Figure 3 shows the three basic types of Kendex inserts mounted on tool shanks.

A typical example of a high production machining operation on an automatic cycling machine is the rough machining of alloy iron flywheels on a Bullard 16" Multi-Matic, shown in Figure 4. The third station of the Bullard rough faces a portion of the flywheel using a ¾" square Kendex button. At a production rate of 110 pieces per hour, 400 flywheels are machined per index. This means the buttons are turned twice during a shift. After the four corners of the button machine a total of 1600 parts, the button is thrown away. Records of tooling costs over extensive production runs have indicated a savings of 3 to 1 by changing from conventional tipped tools to the Kendex buttons.

Another example of how carbide buttons can be utilized to advantage on multiple-spindle tooling is the job shown in Figure 5, the machining of a small steel forging on an 8-Spindle New Britain Automatic. Figure 6 shows the cuts taken by the carbide buttons. By double indexing, both chucking operations are handled on one machine. The button tooling permits ganging up boring, turning, facing, and chamfering cuts on the roughing and finishing operations so that the part comes off the 8-Spindle Automatic completely machined.

Conventional carbide tooling on these operations added up to a tool cost of $.027 per part machined, including the cost of regrinding the tools. This cost is reduced to $.0112 per

. . . Continued on page 185

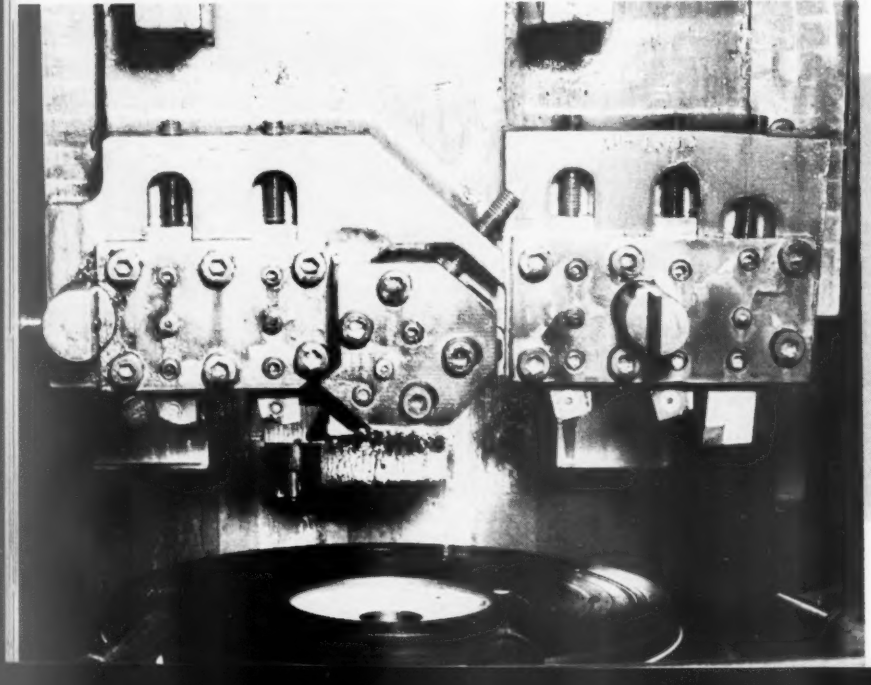
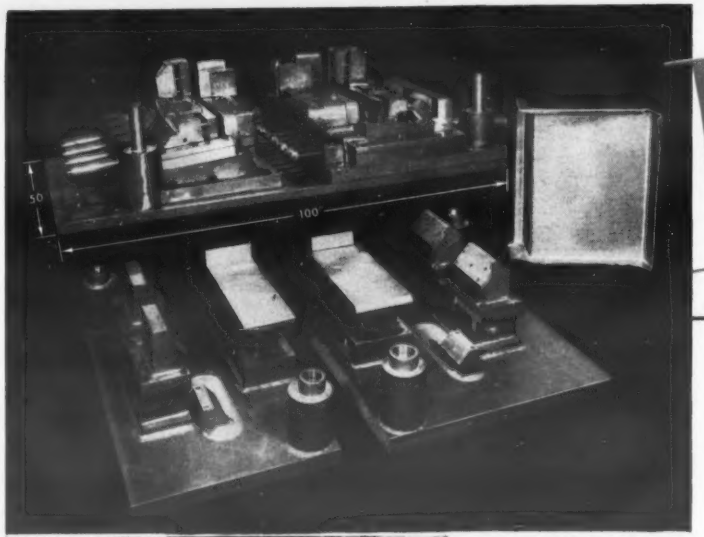
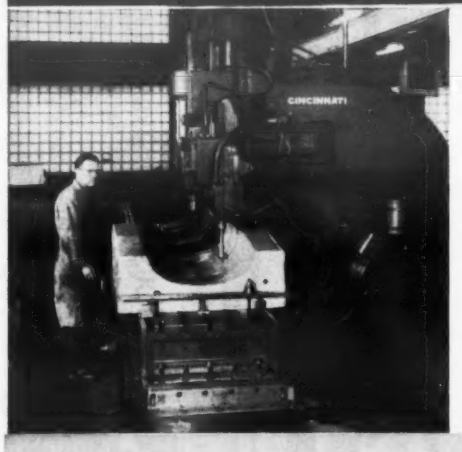


Fig. 4. On modern machine tools designed for multiple tooling, downtime takes on added importance. Insert or button tooling helps keep downtime to a minimum.





ABOVE: Typical tooling job is the Cam Flange Die shown above. This is an adjustable die to cam flange both sides of three different sizes of range tops with one stroke of the press for each top.

LEFT: Showing work done on a typical job—using a 28" x 96" Cincinnati Vertical Hydro-Tel, with automatic tracer and depth control.

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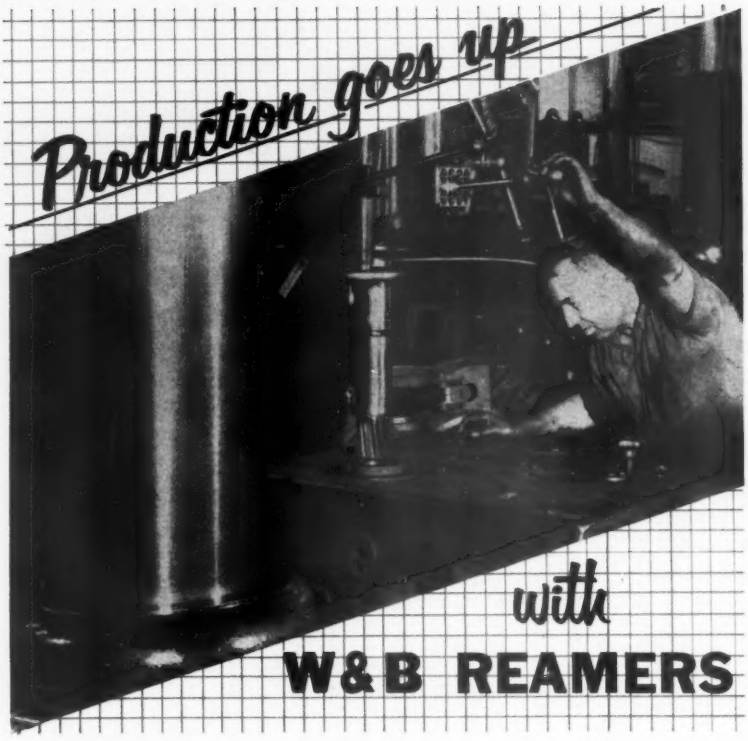
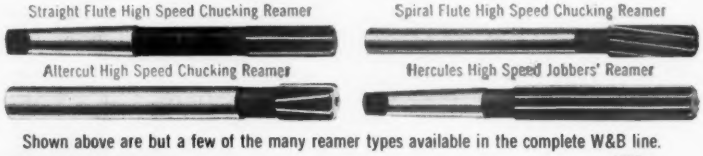


Illustrated above is the reaming of a gear case for an escalator mechanism. A 2.98" diameter Whitman & Barnes shell reamer was used on this reaming operation by a large manufacturer of elevators to secure maximum production, best possible reaming results and reduced costs.

In the complete line of W&B reamers you will find a type and size for nearly every application—each reamer designed and manufactured to the highest standards. Thus, regardless of your reaming application, W&B reamers provide greater production, more holes per grind, longer reamer life, chatter-free operation and accurate holes having super-fine finishes. Be sure your every reaming operation is done with highest efficiency—specify W&B reamers.


Straight Flute High Speed Chucking Reamer
Spiral Flute High Speed Chucking Reamer
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Shown above are but a few of the many reamer types available in the complete W&B line.

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. . . Carbide Tools, from page 92

Coromant Tools are well known and widely used in European metalworking plants. Recent tests made in the U. S. have shown that on a great variety of applications, these tools have a productive life that compares favorably with that of the best competitive brands. The Company claims that this advantage results from basic purity of the raw material, plus close unified control, from the tungsten mine to the finished tool.

Coromant metal cutting tools are available in the U. S. and Canada in all standard grades and in an unusually wide range of standard shapes and angles. Many tools which ordinarily fall into the "special" category will be stocked by Coromant as "standard" types. For example, George Fisher copying lathe tools will be included in Coromant's "standard" category.

Besides the usual grade identification being stamped on the tool shank, the grade is further identified by a symbolizing color painted on the end of the tool shank.

ANNOUNCE DISTRIBUTOR OF FAST ACTION CLAMPS IN NEW ENGLAND AREA

The International Machinery Company of New Haven, Conn., has been appointed New England distributor of the new Hallwell fast action clamps.

They have been sold to many of the leading plants throughout the United States, and according to time studies, conducted, great savings have been effected.

Holding pressures of the clamps range from 1500 pounds to 4000 pounds depending on style and size. Clamping is effected by the wedge-clamp action

of an elliptical, which does not dip or bite into the plunger. The plunger is thrust against the object to be held and the desired pressure is achieved by the operator turning the handle. Full leverage is obtained instantly by manual operation and the use of a wrench is unnecessary.

The clamps come in sizes from 4" to 12" and special sizes can also be designed for certain applications. Data is available from International Machinery. **Inform-A-Gram Key No. D3.**

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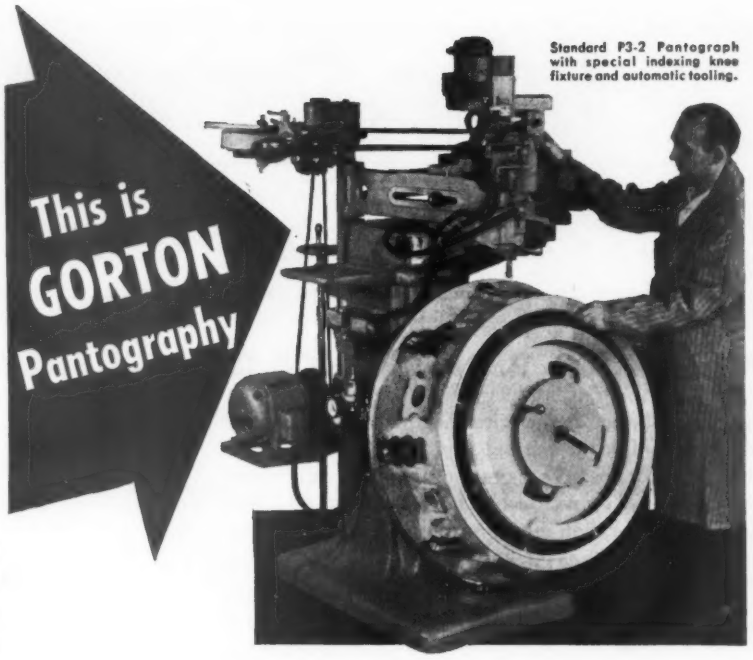
How to figure out the answers to these questions and how to determine the progress and ability of apprentices during their training are explained in a 24-page pamphlet entitled "Evaluating Apprentices" issued by the Bureau of Apprenticeship, U. S. Department of Labor. (This is a second edition of this pamphlet, the contents of which appeared originally in PERSONNEL).

Set forth in the pamphlet is an accounting system itemizing more than 50 cost and profit items involved in apprentice training; and also a series of forms for recording the hours and grade ratings of apprentices as they progress step-by-step during their training, as well as summary forms for annual and final records.

The booklet is designed primarily for the use of training directors, members of joint apprenticeship committees and other responsible for training who wish to determine as exactly as possible the cost of training and the progress of apprentices.

Copies of this booklet may be obtained free of charge by communicating with the Publications Branch of the Bureau of Apprenticeship, U. S. Department of Labor, Washington 25, D. C. When requesting copies, please mention TOOLING and PRODUCTION.



Standard P3-2 Pantograph with special indexing knee fixture and automatic tooling.

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Photo shows a standard P3-2 profiling ports in an aircraft part, a large aluminum-alloy casting. The sides of each port are parallel; one end has a true radius, the other end is parabolic. A combination of other methods would do the cutting in hours, but the P3-2, with an automatic cutting cycle, finishes each port in 2.3 minutes.

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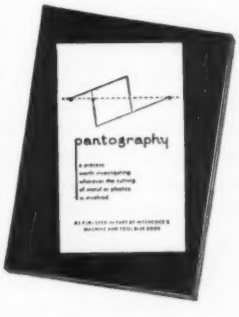

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Holes, Contours, Surfaces

Published in the interests of greater accuracy and quality in the toolroom and on the production line by the Moore Special Tool Company, Inc., 726 Union Avenue, Bridgeport 7, Conn., builders of Jig Borers, Jig Grinders, Panto-Crush Wheel Dressers, Die Flippers, Motorized Centers and a complete line of Hole Location Accessories.

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Just as important as the initial accuracy of a precision machine tool is the *life expectancy* of this accuracy. And the most effective way to insure long-lasting accuracy is to give *dimensional stability* and *wear resistance* special consideration during machine design.

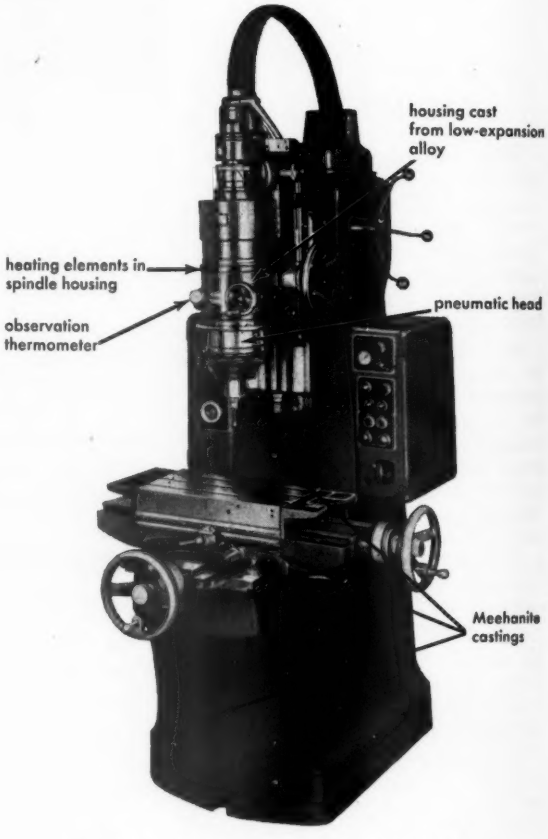
The following causes of dimensional *in*stability are most frequently encountered: thermal expansion, unstable constituents in the material; and stresses in the material. In the design of the No. 2 Moore Jig Grinder, all of these factors were taken into account and special features were incorporated to counteract them.

All the inherent accuracy of a measuring system, capable of positioning the workpiece in relation to the spindle within a tenth, is rendered nearly valueless if the spindle does not retain its position during machining operations. Such movement, caused by thermal expansion, is inevitable unless steps are taken during design to minimize or prevent it.

Electric heating elements were incorporated in the main spindle housing of the Moore Jig Grinder to maintain uniform temperature—whether machine is running or not. An observation thermometer is located so as to indicate any abnormal temperature change within the housing. The housing itself is cast from 36% nickel iron to further minimize effects of temperature variations. And a pneumatic head directs air onto the workpiece, preventing undue temperature rise both in the workpiece and in the locating members of the machine.

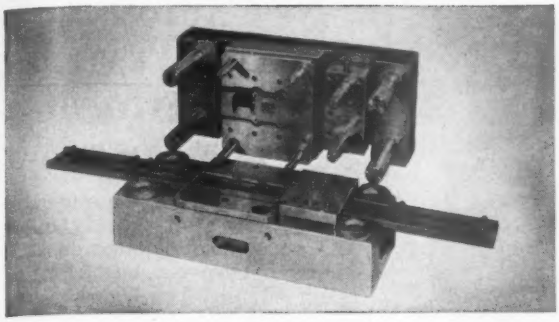
Instability resulting from gradual relaxation of locked-in stresses in castings is prevented by suitable stress-relieving cycles during the manufacture of Moore machine components. Similarly, the best way to avoid unstable hardened steel parts is by tempering them. Moore follows this practice.

Further wear resistance was built into the Moore Jig Grinder by means of: adequate way and bearing surface, scientifically proportioned to minimize and distribute wear; all reciprocating parts of nitrided steel—almost as wear-resistant as carbide; pressure lubrication of ways; lead screws and nuts made from nitrided steel and aluminum bronze, respectively, combining to offer low coefficient of friction, abrasion resistance and hardness; and dust protection devices.

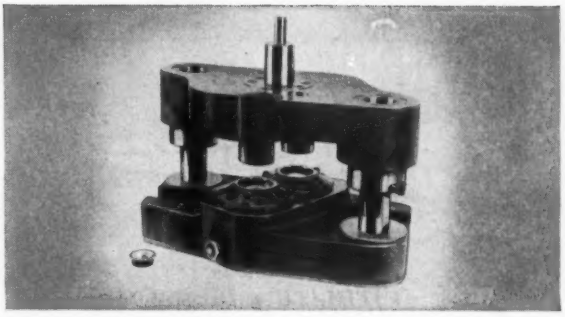


Special design features of the No. 2 Moore Jig Grinder insure permanence of accuracy.

ACHIEVING GREATER ACCURACY QUICKLY is the job of Moore Jig Grinders and Moore Jig Borers. Both make possible accurate lead screw settings within .0001". This team will produce precision holes, contours and surfaces *in your shop* at minimum cost. For detailed catalogs, write to: Moore Special Tool Company, Inc., 726 Union Avenue, Bridgeport 7, Conn.

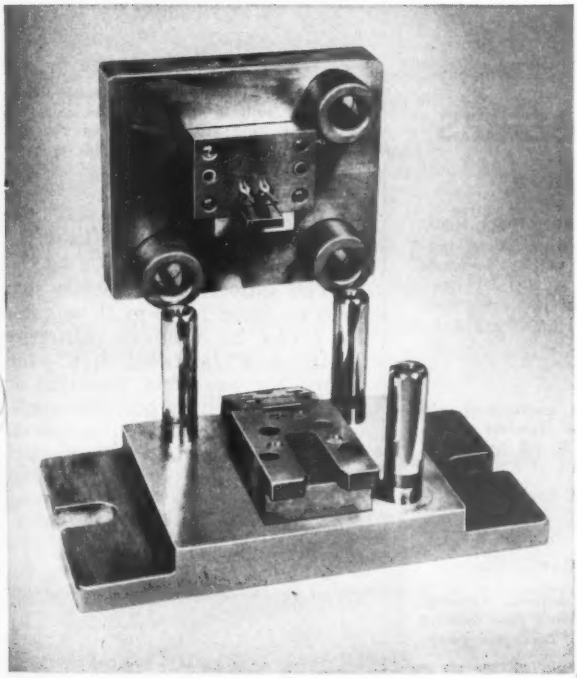


1 Lamination die, made for Schick, Inc., produces rotor and stator laminations of motor-grade silicon steel. Customer reports carbide die produces average runs 35 times as long as steel dies.



2 Blanking and drawing of screw bottle caps is done by this die for Armstrong Cork Company, Lancaster, Pa. Die operated accurately on material .006" thick for months. Steel die had to be changed each week.

Case histories show how dies reduce costs when equipped with Carboloy® cemented carbide



3 Simple pierce and cutoff die, designed for Electric Auto-Lite Co., Toledo, operates at speeds faster than 400 strokes per minute. Die has produced over 2,000,000 strokes . . . and still does not require sharpening.

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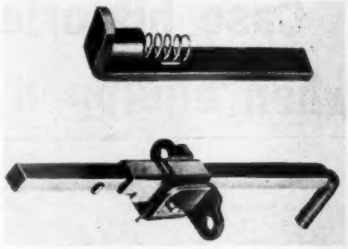

Photos courtesy Danly Machine Specialties, Inc.

Fig. 1. The primary stop is shown above. It has a built in spring for use as a side guide to hold stock square in the die. The universal automatic die stop is shown below.

durably constructed and the stops may be hardened if desired just after fitting.

The universal automatic stop can be fitted in 10 to 15 minutes and can be used on strippers 3/16" x 5" and ¼" x 6"—the stops are available for right or left hand feeding and are adaptable to blanking, progressive, and compound dies. Universal stops are individually packed with trip spring and mounting screws. Primary stops are packed twelve to the box.

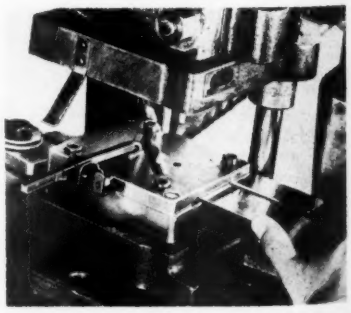

Fig. 2. The automatic die stop and trip spring are shown mounted on a die with stock being fed into the die from the right.

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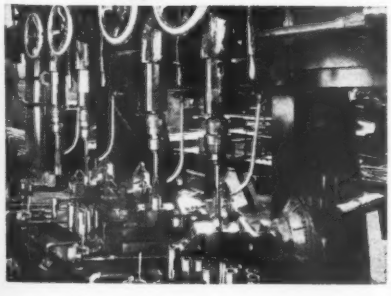

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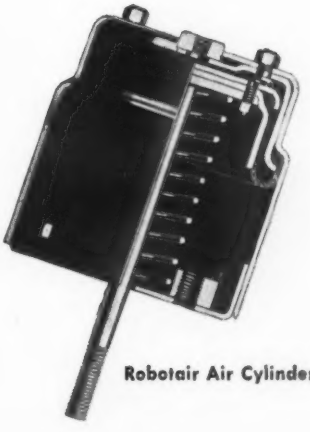

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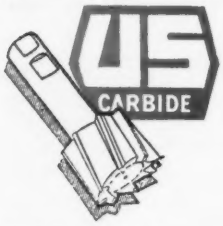
CIRCLE INFORM-A-GRAM KEY NO. 102.1



OHIO'S 1 CALL HEADQUARTERS
for
YOUR TOOLING PROBLEMS
both
HIGH SPEED AND CARBIDE

AMPCO - Ampco Twist Drill Division, Greenfield Tap and Die Corporation. High Speed and Carbon Steel drills, reamers and end mills. Available from stock at U. S. Carbide.

ATRAX - The Atrax Company. Precision Ground, Carbide end mills, reamers, burs, boring tools, grinding tools, knurls and chatterless countersinks, all ground from solid carbide. Available from stock at U. S. Carbide.

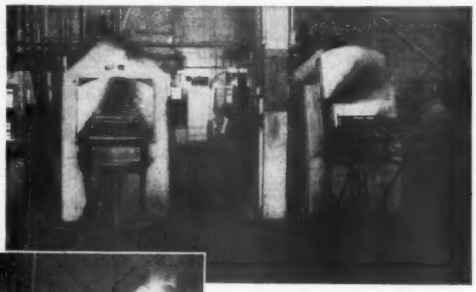
BLACKALLOY- Blackalloy Company of America. Producers of Blackalloy, the non-ferrous, centrifugally cast tool with a natural hardness of 63 Rockwell C, particularly suited to machining of stainless, and ground in all standard sizes and shapes. Stocked at U. S. Carbide.

MURDOCK - Murdock Tool Co., Inc. High Speed interchangeable counterbores, holders and pilots. also Special High Speed tools.

U. S. CARBIDE TOOL SALES, INC.
3269 EAST 49TH ST. • CLEVELAND 27, OHIO
FOR FAST SERVICE CALL BRoadway 1-4433

CIRCLE INFORM-A-GRAM KEY NO. 102.2A

Carbonitriding Furnaces



Give
Lakeside
Customers
Big Production
at
Lower Cost

As one of the newer of our many services, carbonitriding is rapidly gaining in favor as a method of steel treatment that offers advantages not found in other methods. To service this demand, Lakeside is now operating a battery of carbonitriding furnaces that offer flexibility and convenience of service that is winning us new applications for this operation everyday. This process applies to small and large parts. You may have critical specifications that you have to meet—send us samples of your products.

OUR SERVICES: Electronic Induction Hardening, Carbonitriding, Flame Hardening, Heat Treating, Bar Stock Treating and Straightening (mill lengths and sizes), Annealing, Stress Relieving, Normalizing, Pack, Gas or Liquid Carburizing, Nitriding, Speed Nitriding, Aerocasing, Chapmanizing, Cyaniding, Sand Blasting. Laboratory Physical Testing.

Write or Call for copy of our New Brochure.

THE *Lakeside Steel Improvement Co.*
3418 LAKESIDE AVE., CLEVELAND 14, OHIO HENDERSON 1-9100
METAL TREATING INSTITUTE

CIRCLE INFORM-A-GRAM KEY NO. 102.2B

"Hydroform" Demonstrated at PMI Meeting

The Hydroform process developed by the Cincinnati Milling Machine Company, was the principal feature that brought more than sixty members and guests of the Pressed Metal Institute together for their first Fall (1953) meeting. A part of the program included a visit and Hydroform demonstration at the Roland Teiner Company, of Everett, Mass.

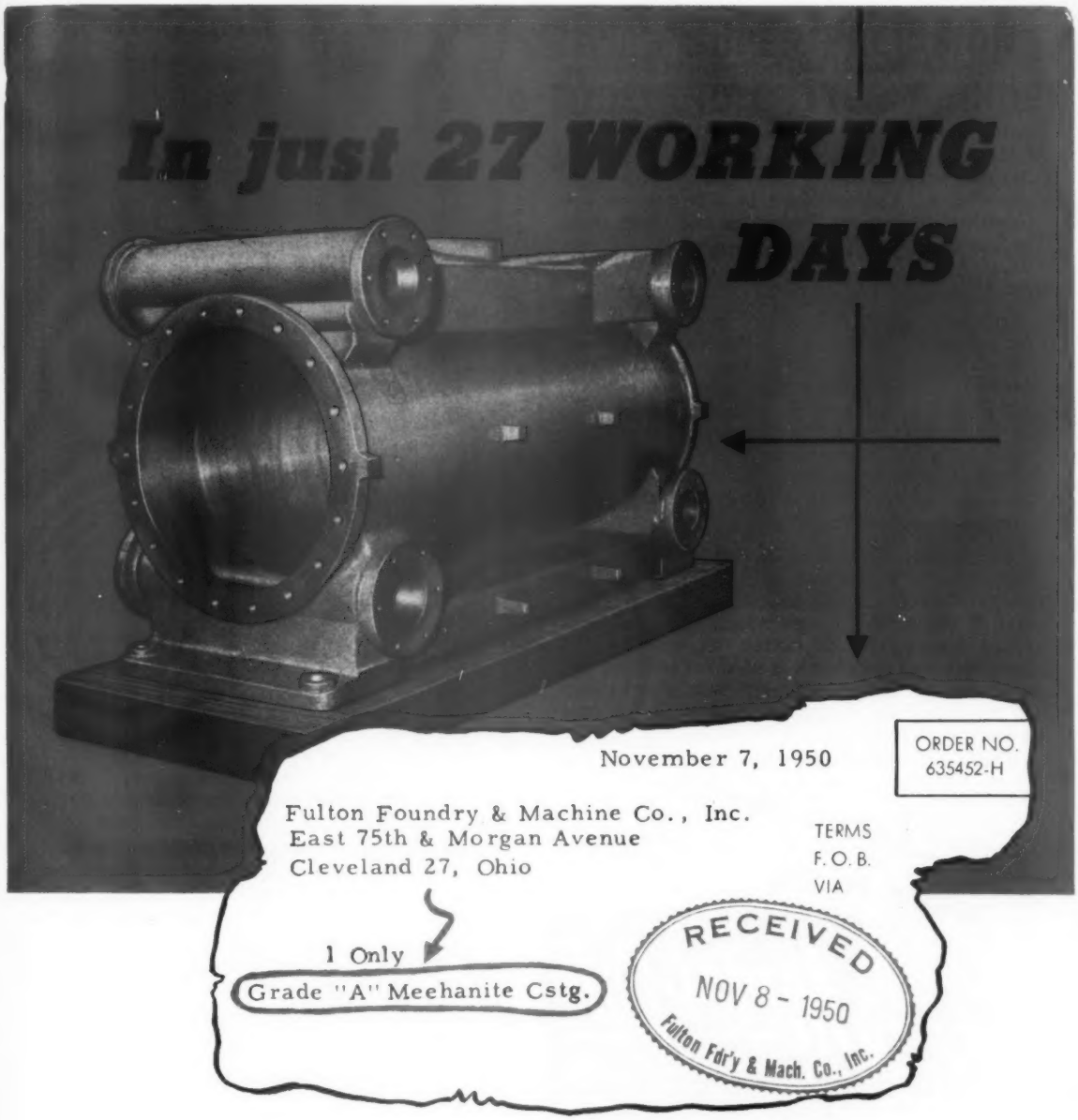
Arthur Woodbury of Roland Teiner Company, Inc., showing John E. King, Chairman of New England District, Pressed Metal Institute — typical parts made by Hydroform.

Members watched the Hydroform make a single draw operation, pressing blanks into shapes usually requiring several draws by stamping, and also witnessed changes in tooling from one part to another. In one case, tools were changed in less than seven minutes, and immediately the Hydroform was producing a different part from a different metal.

The Hydroform is a cavity type, hydraulically operated ram and head machine, designed, so that pressures up to 15,000 psi can be controlled to press metal around the punch. No metal die is required with this process.

At the demonstration meeting, representatives of the Cincinnati Milling Machine Company talked briefly about this latest contribution to the pressed metal industry, and the types of work where this process provides the industry with economic advantages.

Chief among these were the cost advantages of less expensive tooling; producing more complex shapes, with fewer operations; and being able to produce parts in small quantities for research and experimental work.



THIS 30" x 60" High Pressure Steam Mill Engine cylinder weighing nearly 5 tons was cast and machined in just 27 days and shipped to a large steel producer. Just another outstanding example of Fulton's unusual Jobbing Foundry and Machine Shop facilities for hurry up calls on breakdown work.

FULTON FOUNDRY & MACHINE CO., INC.

East 75th & Morgan Avenue • Cleveland 27, Ohio • Phone MI 1-8400

EQUIPPED FOR HEAVY, MEDIUM OR LIGHT JOBBING PRODUCTION
HEAVY JOBBING MACHINE SHOP—METALIZING

MEEHANITE® CAST IRON STEEL BRIDGES THE GAP

CIRCLE INFORM-A-GRAM KEY NO. 102.3

Carbide Cutters Boost Thread Milling 300%

Thread Milling of ball raceways in actuating nuts is today being handled efficiently and economically with tungsten carbide-tipped cutters at the plant of Vard, Inc., of Pasadena, Calif., nationally known manufacturers of Ball Screw actuators and Hour-Glass worm-gear assemblies. Cutters used in this process are produced in various diameters and tooth radii in Vard's own tool room.

Typical operation is on an SAE 8620 (70-90,-000 psi tensile strength) steel main-gear actuating ball nut in which the raceway's major diameter is 3.062-inch. Sixteen and three-quarter turns or threads are milled in the raceway at 18 IPM (rotation of workpiece), 0.0045-inch chipload per tooth, 328 rpm (rotation of cutter), and 0.100-inch depth of cut. Approximately 0.007-inch stock is left for finish grinding after heat treating. Their carbide cutter turns clockwise while the workpiece is turning counter-clockwise.

Equipment First Overhauled and Modified —Machining is done on a Shields thread mill modified with a 100-pound flywheel on one end of the quill through which the coolant is piped directly to the cutter. A combination faceplate and pot chuck is used for holding the workpiece. This equipment was overhauled to minimize backlash and bearing play, and a five-horsepower motor installed.

Cutter for this operation is of 2.500-inch diameter having twelve Kennametal K4H teeth of 0.153-0.154-inch radius, 3-degree negative radial rake, and 0-degree axial rake.

Various grades of tungsten carbide first used in this cutter gave only two or three pieces per grind. Now, tipped with Kennametal, nine pieces are easily machined between grinds.

A 5-degree positive axial rake on alternate teeth was tried. Since this design change increased grinding costs without improving finish or cutter life, it was dropped in favor of the 0-degree axial rake. Accurate cutter regrinding is essential to maintain a present cutter life rate of nine pieces per grind.

Photo courtesy Kennametal Inc.

Thread milling ball raceways in actuating nuts is done efficiently and economically in a Shields Thread Mill with Grade K4H-tipped-cutters.

Typical operation is on a 8620 steel gear actuating ball nut in which major diameter of raceway is 3.062". Sixteen and three-quarter turns are milled at 18 IPM (rotation of workpiece), .0045" chip load, 328 rpm, and .100" depth of cut. The cutter turns clockwise and workpiece turns counter-clockwise.

The cutter for this job is 2.500" diameter with 12 teeth having .153"-.154" radius, 30° negative radial rake, and 0° axial rake.

Various grades first used in cutter gave only 2 or 3 pieces per grind. With the Grade K4H cutter 9 pieces are machined per grind.

*Trade Mark Registered U. S. and Foreign Patents Pending

NO DRILLING • SCREWS • RIVETS

METAL-CALS consist of a .003" thickness of aluminum foil anodized and dyed, backed with high-tensile bonding material. A METAL-CAL, with your name or message etched into its surface, can be swiftly applied to any smooth, cohesive surface of metals, porcelain, bakelite, polysterene, glass, woods, paints or enamels. Once on—*it stays on!*

Only METAL-CALS offer all these advantages:

LONG LIFE • ECONOMY
SIMPLICITY OF APPLICATION
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METAL-CALS have found acceptance and wide use in industries everywhere—wherever there is need for an inexpensive, permanent method of identification.

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19846 Henry Road, Cleveland 26, Ohio
Plants In: **Inglewood, Calif., Seattle, Wash.**

CIRCLE INFORM-A-GRAM KEY NO. 102.4

ALUMINUM BRAZING METHODS ARE OUTLINED IN NEW MOVIE

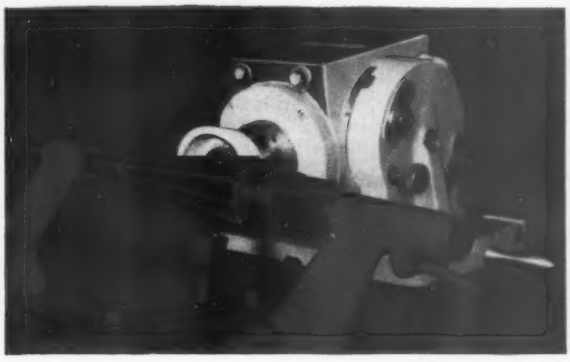
A demonstration and explanation of the latest light-metal brazing techniques is offered to industry by Aluminum Company of America in a new color movie.

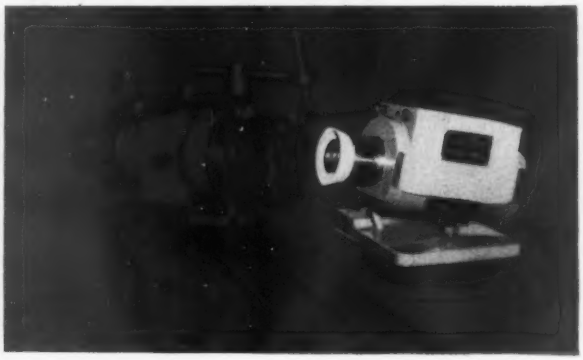
The 22 minute, 16 mm. sound film, "New Horizons in Aluminum Brazing," offers a comprehensive glimpse of the advantages brazing provides in the design and fabrication of aluminum products. The movie shows what can be done in joining parts by brazing, and how to do it.

The basic aluminum brazing methods, explained in the film, are torch brazing with a gas torch, furnace brazing where the furnace supplies the heat source; and dip brazing where the assemblies to be joined are dipped into a hot salt bath furnace filled with molten flux.

Specify THIS NEW POPE SUPER PRECISION 1 HP, 3600 RPM MOTORIZED TOOL AND CUTTER GRINDER CLEARANCE ANGLE SWIVELLING HEAD

With Angular Adjustment In A Vertical Plane





TIME AND MONEY SAVING FEATURES:

1. Cup wheels, generally considered best for cutter grinding, can be used for practically all clearance angles on this new head.
2. Cup wheels produce a cutting edge on tools that lasts longer because it is stronger.
3. The tooth rest remains on the center line of the cutter for practically all grinding on centers or in the work head.
4. Most cutters and reamers can be ground all over with one set-up, using the swivelling table and Pope tilting head. The usual second and third set-ups are no longer required.
5. All clearance angles read directly in degrees from the scale provided on the head. Mistakes on clearance angles are avoided.
6. The right clearance angle is assured on tools difficult to grind, such as slab mills, taper reamers, angular cutters and form tools.
7. 3600 R.P.M. — one wheel speed — safe for all wheels generally used on cutter grinders. Heat checking of cutters is virtually eliminated.
8. The operating ease and convenience of this new Pope Head with the angular adjustment in the vertical plane saves you time and money on every tool you grind.

ASK FOR COMPLETE SPECIFICATIONS

No. 96

Specify **POPE** PRECISION SPINDLES

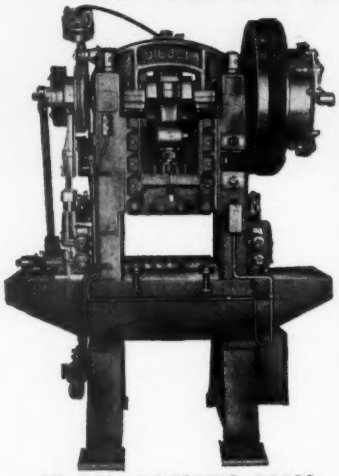
POPE MACHINERY CORPORATION
Established 1920
261 RIVER STREET • HAVERHILL, MASSACHUSETTS

CIRCLE INFORM-A-GRAM KEY NO. 103

DIEBEL PRESSES

Built Like
Precision Dies

6 REASONS WHY You Should Investigate DIEBEL PRECISION-BUILT AUTOMATIC PRESSES



1 *Less* DOWN TIME

2 *Fewer* PRESS REPAIRS

3 *Longer* DIE LIFE

4 *Lower* DIE MAINTENANCE

5 *Greater* PRODUCTION

6 *Smaller* PIECE PART COST

40-TON DI-MATIC PRESS EXCLUSIVE FEATURES

- **Cylindrically Shaped Ram, Precision Ground** — guarantees perfect alignment of punch and die.
- **Crankshaft Supported by Four Bronze Bearings** — assures greater press rigidity.
- **Keyed and Tie-Rod Frame Construction**—eliminates press deflections.
- **Built-in Shock Absorbers**—minimize vibration and die shock.

Also 5-Ton • 8-Ton • 12-Ton DI-MASTER PRESSES • Write for Catalog

DIEBEL

Precision-Built Automatic

PRESSES

Di Machine Corporation 2708 W. IRVING PARK ROAD CHICAGO 18, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 104

. . . Drilling from page 66

dividually with the proper feed rate, spindle speed, and depth limitation for the operation it is performing.

These drills can be quickly set up to duplicate the performance of elaborate custom-built special-

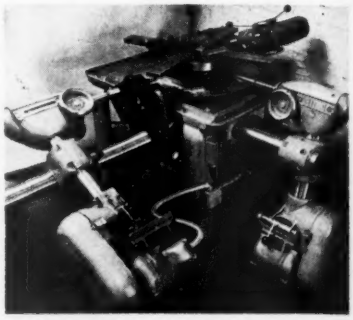


Fig. 3. This three drill head set-up with indexing fixture uses horizontally positioned columns passing under the table in two directions.

purpose machines. Such machines can perform only their designed function, but Magna Drill can be easily reset for other, different operations without special tooling. It therefore, makes the production economies and reduced labor costs of automatic simultaneous multiple drilling or

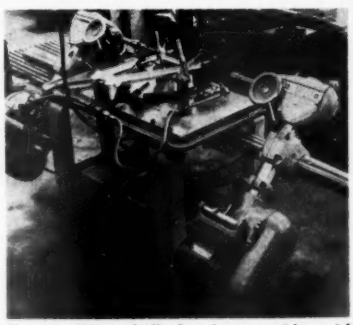


Fig. 4. This drill head assembly with manual feed, opposed spindles performs five drilling, reaming and back spot facing operations on aircraft parts in a Los Angeles plant. Quick change chucks facilitate the changing of tools.

tapping economically practical and physically available for even modest quantities in any shop of any size.

Its flexibility is such that any number of heads can be quickly set to drill to the center of a sphere from any point on the surface of a sphere. Heads will take any attachment and perform any operation practical on conventional drilling machines. Mechanical gear feeds are complete package units driving directly

. . . Continued on page 132

You're missing something if you overlook

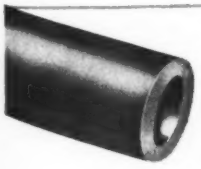
CRUCIBLE HOLLOW TOOL STEEL

If you make tool steel parts with machined-out centers, don't overlook the many benefits of using Crucible Hollow Tool Steel.

It eliminates drilling, boring, cutting-off and rough facing operations. Naturally, this cuts overall production time, steps up machine capacity and reduces scrap losses. Many manufacturers have been able to cut material costs alone by as much as 20% when they use Crucible Hollow Tool Steel instead of regular bar stock.

Crucible Hollow Tool Steel is available in three famous grades: KETOS oil hardening, AIRDI 150 air hardening, and SANDERSON water hardening tool steels. We supply it with machine finished inside and outside diameters and faces — cut to your specific length requirements. And no steel producer can assure you of more uniform quality. For we have complete control over every phase of manufacture and distribution.

For more information, call the Crucible warehouse nearest you . . . or write for new brochure describing Crucible Hollow Tool Steel. Address Crucible Steel Company of America, Dept. TP, Oliver Bldg., Pittsburgh 22, Pa.



CRUCIBLE first name in special purpose steels

54 *years of* *Fine* *steelmaking*

HOLLOW TOOL STEEL

CRUCIBLE STEEL COMPANY OF AMERICA • TOOL STEEL SALES • SYRACUSE, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 105

For Ease and Convenience Use TOOLING and PRODUCTION Inform-A-Gram Cards

Single Point Carbide Tools for all applications are described in a new 12-page brochure put out by The DoAll Co., Des Plaines, Ill. Standard unground carbide tips as well as carbide tips for threading tools, reamers, scrapers, etc., also are shown. Besides this, carbide inserts and carbide tips for lathe and grinder centers are listed. Data on producing chip control grooves on the cutting surface of carbide tools are an added feature of the bulletin.
Circle Inform-A-Gram No. B1.

Replacement Cylinders. Here is a detailed account of the complete line of "H-T Sincolite" replacement plating cylinders for new or old plating barrel superstructures. A novel and convenient "Specifications Diagram" is inserted in the bulletin (RC-101), providing the plater with a cylinder drawing on which cylinder dimensions can be marked and returned for quotation. The brochure has been released by The Singleton Co., 5317 St. Clair Ave., Cleveland 3, Ohio.
Circle Inform-A-Gram No. B2.

Collets and Feed Fingers. Every size and type collet and feeder is illustrated and described in Sutton's new comprehensive catalog. Designed to provide a quick, easy reference, it lists the correct collet, feeder and pad for automatics, hand machines, turret lathes, milling machines, production and engine lathes. For your copy write to Sutton Tool Co., Dept. TP11, Sturgis, Mich.
Circle Inform-A-Gram No. B3.

For Precision Machining. The M-400 electronic type machine tool for form drilling of carbide and hardened dies is illustrated and described in a brochure now available from the Elox Corp. of Michigan, 740 N. Rochester Rd., Clawson, Mich. This machine also is capable of form drilling where heat treating may cause difficulties in sinking a shape to required depth.
Circle Inform-A-Gram No. B4.

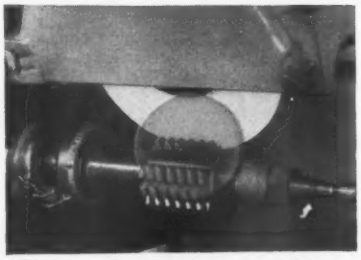
Carboloy Hevimet is used in a wide variety of industrial applications because of its unique combination of outstanding physical properties. A product of power metallurgy, Hevimet is almost 5 per cent heavier than lead. Its tensile properties are better than most non-ferrous metals and alloys, and it is readily machined. Read all about its applications, and specifications. Write to Carboloy, Dept. of General Electric, 11177 E. 8 Mile Rd., Detroit 32, Mich.
Circle Inform-A-Gram No. B5.

Hevi Duty Vertical Milling Attachment. Vertical milling operations can be handled efficiently on the larger Cincinnati Plain and Universal milling machines with the aid of the heavy duty vertical milling attachment. Write to the Cincinnati Milling Machine Co., Cincinnati 9, Ohio, for illustrated literature.
Circle Inform-A-Gram No. B6.

A Template Catalog on West Point standard fixture clamps and components is now available from the West Point Mfg. Co., 26935 West 7 Mile Rd., Detroit 19, Mich. The booklet contains full scale template drawings suitable for tracing, on seven different clamp assemblies and 14 different standard fixture parts.
Circle Inform-A-Gram No. B7.

New G Bond

"Now with a G Bond wheel we can go completely around a 16-inch face mill," writes the tool supervisor of a New Jersey plant. "Previously, due to wheel wear we had to index this type of cutter at four different positions. Now, on a finish cut we can go completely around, and the cutter runs absolutely true within .0005 inches. These new G Bond wheels have very good, cool cutting action, don't break down or leave jagged edges . . . We'll be using plenty of them on our tool room jobs."



"Better cut and less burn than previous Norton or other make wheels. We're reordering 250 G Bond wheels," was the comment from this Ohio tool company.

Lengthen wheel life up to 50%. Norbide dressing sticks, of hardest man-made material, last for years, keep your G Bond and other tool wheels in top condition.

PREVIEWS

Circle postage-free Inform-A-Gram Key Number for your request

TOOLING and PRODUCTION'S Inform-A-Gram Section is a CARDload of Information

Pneumatic Tools. Hot off the presses, this well-illustrated catalog shows the very latest pneumatic tools available. Some of the items featured are die grinders, drills, polishers, sanders and circular saws. For your copy write to the Mall Tool Co., 7740 South Chicago Ave., Chicago 19, Ill. or—
Circle Inform-A-Gram No. B8.

Drilling & Tapping Machines. Latest developments in Vertical Motor Cone-Pulley Drive Drilling and Tapping machines have just been released to the industry by the Edlund Machinery Co., Cortland 38, N. Y. An 8-page Bulletin (No. 130) gives all essential data on Edlund's Model 2B, 3B and 4B machines.
Circle Inform-A-Gram No. B9.

800 Carbide Tools. Fifty-one pages of carbide information are given in this bulletin from Nelco Tool Co., Inc., Manchester, Conn. Colorful and comprehensive, this fact-packed brochure has been designed to serve as a ready reference for designers, tool engineers, production supervisors and others interested in the production-increasing applications of Nelco carbide tools.
Circle Inform-A-Gram No. B10.

Cemented Carbide Die Nibs. Carboloy's Header Die Manual D-131 tells how to drill, assemble and finish Carboloy cemented carbide new grade 190 rough cored header die nibs. Illustrations and specifications included. Write to Carboloy, Dept of General Electric Co., 11177 E. 8 Mile Rd., Detroit 32, Mich. or—
Circle Inform-A-Gram No. B11.

Carbide Tools. A detail study of carbide tools is presented in a booklet put out by the Atrax Co., 240 Day St., Newington 11, Conn. In the brochure, Atrax offers a new line of drills of high quality materials and produced under precision methods. Actual size illustrations, combined with specifications and actual case histories of special carbide requirements handled tend to make this catalog extremely complete and informative.
Circle Inform-A-Gram No. B12.

Metals and Tools. The Willey's Carbide Tool Co., 1340 W. Vernor Highway, Detroit 1, Michigan, presents its latest price lists on tungsten carbide metals and tools for work support blades, lathe and grinder centers, and diamond dressers.
Circle Inform-A-Gram No. B13.

Tungsten Carbides. This booklet contains specifications and prices on tungsten carbide blanks, "Modified" standard blanks and solid carbide cylinders. It is available from the Adamas Carbide Corp., Harrision, N. J.
Circle Inform-A-Gram No. B14.

Mastic Coatings. Detailed information concerning the many products fabricated of sheet metal which can be improved greatly through an application of Nox-Sound mastic coatings is contained in a new pamphlet available from the Non-Rust Chemical Corp., Mastics Div., 333 North Michigan Ave., Chicago 1, Ill. This masking coating not only deadens sound, but insulates, and is waterproof and rustproof.
Circle Inform-A-Gram No. B15.

sets new records in tool room grinding!

Here's Proof . . . Users praise the many

"TOUCH of GOLD"

advantages in Norton pace-setting wheels

Norton G Bond wheels have sure started something! In tool and cutter grinding, as in many other forms of precision and semi-precision grinding, they're giving users an entirely new slant on how efficient, long-lasting and profitable wheels can be.

What users say about New G Bond Wheels

"Good finish, longer wheel life."

"Heavier feeds without burn."

"Run absolutely true."

"No breakdown — no jagged edges."

"Cut freely, hold shape with no burning."

"They show how a real wheel will cut."

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

G Bond Alundum Wheels In Your Own Tool Room*

will take heavier cuts in expensive, heat-sensitive steels without drawing temper. They'll reduce tool spoilage, give you closer tolerances and smoother finishes than you ever got before — with fewer wheel changes and machine adjustments . . . Those are the value-adding, money-saving "Touch of Gold" advantages that make G Bond wheels outperform any others you ever used.

Your Norton Distributor

can recommend the right G Bond wheels for your jobs. Contact him or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your classified 'phone directory. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

W—1531

NORTON ABRASIVES

Making better products . . . to make other products better

16" Precision Drilling Machines are the subject of a brochure available from The Electro-Mechano Co., 260 Erie St., Milwaukee 2, Wis. Illustrations, specifications and special features of the machines are presented. **Circle Inform-A-Gram No. B16.**

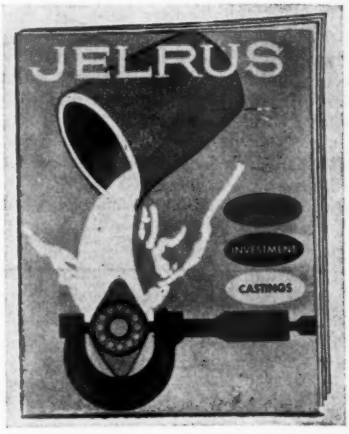
Centerless Lapping. This brochure explains why the Size Control centerless lapping technique effectively reduces production costs and gives more accurate results. Write to Size Control Co., 25 W. Washington Blvd., Chicago 12, Ill., for Bulletin L-53 or—
Circle Inform-A-Gram No. B17.

Hydraulic Duplicating Lathes. Bulletin No. 35 gives a complete description and shows many examples of the hydraulic duplicating lathes made by the American Tool Works Co., Pearl St. at Eggleston Ave., Cincinnati 2, Ohio.
Circle Inform-A-Gram No. B18.

A Shop Instrument for measuring the average micro-inch height of waviness around symmetrical surfaces of rotation such as bearing races is described in a new bulletin available from the Micrometrical Mfg. Co., 345 S. Main St., Ann Arbor, Mich. **Inform-A-Gram No. B19.**

CIRCLE INFORM-A-GRAM KEY NO. 108

Precision Investment Castings. This booklet tells as well as illustrates the complete process of precision investment casting which involves reproducing intricate parts cast to close tolerances. This great-



ly reduces and many times completely eliminates subsequent machining. The booklet, showing the concrete aspects of this type of casting is almost equal to a visit to the Jelrus Precision Casting Corp., 136 W. 52nd St., New York 19, N. Y.
Circle Inform-A-Gram No. B20.

The Special Alloy, Elgiloy, developed originally by Elgin for watch mainsprings, but suitable to a wide variety of other applications, has been released for general industrial use. Complete information on the alloy is available in a new bulletin which discusses corrosion resistance data and other specific characteristics of the alloy. It will be sent on request to Elgin National Watch Co., Abrasives Division, Elgin, Ill.
Circle Inform-A-Gram No. B21.

Specialized Instrument Catalog A new condensed bulletin has been published by F. W. Dwyer Mfg. Co., 317 S. Western Avenue, Chicago 12, Ill. It presents the company's line of specialized instruments and gages. Included are instruments for accurate measurement of combustion, draft, pressure, flow, vacuum, CO_2, smoke, velocity, static pressure, pressure differential, temperature and other operating variables.
Circle Inform-A-Gram No. B22.

Involute Checker. Details of the Model 1136 Sine-Line involute checker, built to check involutes of gears up to 36" P.D., and with a maximum spread between centers of 26", are contained in Bulletin 1136-53 just released by Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. The folder explains how the machine can be used for checking the involute of spur and helical gears, tooth spacing of both types of gears and the involute of internal gears.
Circle Inform-A-Gram No. B23.

Shop Stools & Chairs. A 12-page bulletin on Hallowell shop stools and chairs has been prepared by the Standard Pressed Steel Co., Box 600, Jenkinstown, Pa. The publication (No. 704-4) pictures and describes 14 stool models, including knock-down, adjustable, filing and revolving-seat stools, and three chair molels.
Circle Inform-A-Gram No. B24.

All Kling Combination shear, punch and coper machines equipped with one-shot lubrication now will be automatically lubricated by forced feed. This is the latest of the many features incorporated in this "jack-of-all jobs"; a single machine which does shearing, punching, notching, slitting and coping operations of all kinds. Descriptive bulletins may be obtained by writing Kling Bros. Engineering Works, 1320 N. Kostner Avenue, Chicago 51, Illinois, or—
Circle Inform-A-Gram No. B25.

Internal Comparators. These are precision measuring instruments designed to gage the internal diameters of parts accurately and rapidly. There are several standard models described in detail and illustrated in a new booklet available from Pratt & Whitney Division, Niles-Bement-Pond Co., West Hartford, Conn.
Circle Inform-A-Gram No. B26.

Speed Steels. This bulletin (No. 901) describes speed case and speed treat free machining steel plate. Speed case is a low carbon open hearth plate and speed treat is a medium carbon open hearth plate. The bulletin is available from W. J. Holliday & Co., 545 W. McCarty St., Indianapolis 7, Ind.
Circle Inform-A-Gram No. B27.

Grinder-Miller. The Precise Super 40 is a multi-purpose, electrically powered grinder-miller built for precision, high-speed applications. The story of both inside and outside design features of this new tool is well told in a brochure now available from the Precise Products Corp., 1328-30 Clark St., Racine 1, Wis. Also included is an outline drawing of the tool, plus mechanical and electrical data.
Circle Inform-A-Gram No. B28.

Quality Cutting Tools—both carbide and high speed steel—are illustrated and described in Waukesha Tool's Catalog No. 24. Commented on are inserted blade reamers, inserted blade counter bores, spade drills, tap drivers, boring bars, floating tool holders and special tools. Recommended cutting speeds and hints for grinding reamers are also included. Booklet available from the Waukesha Tool Co., Waukesha, Wis.
Circle Inform-A-Gram No. B29.

What is Vapor Degreasing? What does it do? Where is it used? You will find the answers to these questions in an interesting, illustrated booklet prepared by the Phillips Mfg. Co., 3475 Touhy Ave., Chicago 45.
Circle Inform-A-Gram No. B30.

Mounted Points, custom made to Detroit Mold Engineering specifications by the Norton Co., are illustrated and described in a brochure now available from the Detroit Mold Engineering Co., 6686 E. McNichols Rd., Detroit 12, Mich. Specifications, dimensions and prices included.
Circle Inform-A-Gram No. B31.

Straightening Equipment is pictured and described in Bulletin No. 25, recently released by the Sutton Engineering Co., Bellefonte, Pa. A guide to selecting equipment for particularized applications is included.
Circle Inform-A-Gram No. B32.

Learn How. You may be able to increase the capacity of your small drill presses with the Pull-Gear speed. reducer. How it operates, prices and specifications are given in a catalog sheet available from The Pull-Gear Co., 4118 E. 8 Mile Rd., Detroit 34, Mich.
Circle Inform-A-Gram No. B33.

FRAY TOP SLIDES
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Fray NO. 10RH MILLING MACHINE
UNIVERSAL RAM • TURRET TYPE
A Fray pays bigger production dividends by performing an unequalled range of milling operations. Both of the top slides on the Fray 10 RH are easily adjustable. This feature permits alignment of the turret slide with the table, thus doubling longitudinal and cross milling range . . . or you can just as simply set the turret at an angle to the table and mill in two directions. Combined, the turret slide and table slide provide 38" of overall travel, while the table cross slide, plus the ram slide permits a full 18" of in-and-out adjustment. This equals the overall range of much larger machines. Fray moves precision work faster at less cost.
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For deep, heavy cuts. Permits working to extra close limits. Any angle up to compound 2-way. Request Bulletin 4
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2935 NO. ONTARIO STREET, BURBANK, CALIFORNIA
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Lathe Chucks. A new illustrated 4-page folder, giving specifications on a line of lathe chucks imported from England, is available upon request to De Witt Equipment Co., 136 Lafayette St., New York 13, N.Y.
Circle Inform-A-Gram No. B34.

Lapping Machines, made by Spitfire produce super-fine, micro-inch surface finishes—at low cost. Pertinent information which includes complete specifications and illustrations, is contained in a bulletin now available from the Spitfire Tool Co., 2931 N. Pulaski Rd., Chicago 41, Ill.
Circle Inform-A-Gram No. B35.

Revised Prices on die-makers' springs are covered in a 4-page supplement now available from the Producto Machine Co., Bridgeport, Conn. These prices, which became effective Sept. 1, 1953, supersede all previous pricing data on this product.
Circle Inform-A-Gram No. B36.

Wet Blasting Machine. A bulletin (No. 93), describing its new Model 30 Liquamatte wet blasting machine has been published by the American Wheellabrotor & Equipment Corp., 1183 S. Byrkit St., Mishawaka, Ind. Complete specifications and illustrations are presented.
Circle Inform-A-Gram No. B37.

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Welding Booklet. A 32-page "DirectoRod Guide" has been published by the Eutectic Welding Alloys Corp., Flushing, N. Y. This comprehensive booklet gives recommendations for over 300 types of metal joining operations. There are over 40 illustrations of practical applications taken from case history files and there are 12 pages of easily followed charts.
Circle Inform-A-Gram No. B38.

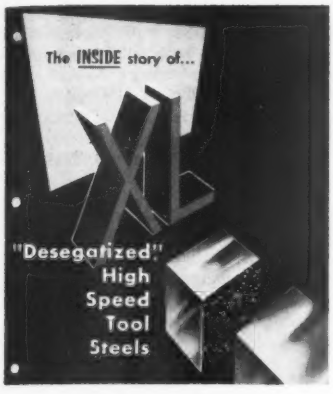
Engine Lathes. This pocket-sized folder shows in a graphic manner how Boye & Emmes heavy duty engine lathe improved designs have been contributing to the industry for 58 years. Also available from the firm are bulletins on medium and heavy duty engine lathes. The literature is offered by Boye & Emmes Machine Tool Co., 81 Caldwell Dr., Cincinnati 16, Ohio.
Circle Inform-A-Gram No. B39.

Graphic Tool Steels. The aim of this booklet is to make available a relatively complete picture of the four Timken graphitic tool steels—Graph-Tung, Graph-Al, Graph-Mo and Graph-M.N.S.—produced by the Timken Roller Bearing Co., Steel and Tube Div., Canton 6, Ohio. The comprehensive booklet contains heat treating data, physical properties and many interesting applications.
Circle Inform-A-Gram No. B40.

Pedestal Tool Grinder. South Bend Lathe Catalog 5328 describes the recently introduced 8" and 10" South Bend pedestal tool grinders. This 2-color folder illustrates the chief design improvements: interior-mounted and protected motor; wheel weight taken off motor bearings; and large eyeshields with built-in lighting. Full information and specifications on request from South Bend Lathe, South Bend, Ind.
Circle Inform-A-Gram No. B41.

Severance Carbo-Mills are the answer for rugged, economical Carbide Mill adaptable to most types of shop work. The uses of Caro-Mills cover a wide range of operations such as removing gates, fins and risers; breaking sharp corners and edges; and removing weld beads. Bulletin 19CM gives complete details and specifications. It is available from Severance Tool Industries, Inc., Box CM-850, Saginaw, Mich.
Circle Inform-A-Gram No. B42.

Indexet Mechanisms, fixed and adjustable types, for automatic remote index setting of pneumatic controllers are described in Bulletin 8930 available from the Industrial Division of Minneapolis-Honeywell Co., Wayne and Windrim Aves., Philadelphia 44, Pa. The folder features construction, operation and applications of the devices.
Circle Inform-A-Gram No. B43.



The XL Story. This "Desegatized" high speed tool steel is the result of extensive research by Latrobe metallurgists. Uniformly distributed in XL are sulphide lubricants in an entirely new form. Literature telling the whole story of this steel is available from the Latrobe Steel Co., Latrobe, Pa.
Circle Inform-A-Gram No. B44.

Adjustable Push Broaches for precision keyways are illustrated and described in Bulletin 15 now available from Kase Machine Co., 18430 Nottingham Rd., Cleveland 19, Ohio. Dimensions and specifications included.
Circle Inform-A-Gram No. B45.

Precision Grinders. A new 20-page catalog issued by the Landis Tool Co., Waynesboro, Pa., describes the firm's 18" and 24" plain and roll grinders. Contains 37 photographs, 7 sketches and complete specifications. It will be sent to TOOLING and PRODUCTION readers requesting it.
Circle Inform-A-Gram No. B46.

Granite Surface Plates. Catalog No. 510 covers Taft-Peirce's line of granite surface plates. The new bulletin points out their principal features and advantages, as well as listing specifications of the large range of plate sizes. The address is The Taft-Peirce Mfg. Co., Woonsocket, R. I.
Circle Inform-A-Gram No. B47.

Conveying Equipment. A New 16-page illustrated catalog of Rapistan conveying equipment is now available from The Rapids-Standard Co., Inc., 342 Rapisan Bldg., Dept. GC, Grand Rapids, Mich. It is catalog GC-53.
Circle Inform-A-Gram No. B48.

Punch Presses that are designed to meet today's demand is the subject of a new brochure now available from the Service Machine Co., 7627-33 S. Ashland Ave., Chicago 20, Ill. Includes illustrations and specifications.
Circle Inform-A-Gram No. B49.

The Comtorplug Method of Gaging Holes is explained in this folder. The simplicity, accuracy and versatility of the gage, made by the Comtor Co., Waltham 54, Mass., are pointed out in Bulletin 46.
Circle Inform-A-Gram No. B50.

Unusual Non-Destructive Testing Instruments are interestingly described in Bulletin 32 just issued by the J. W. Dice Co., 1 Engle St., Englewood, N. J. Featured are those instruments applicable to the metalworking, automotive and aircraft industries.
Circle Inform-A-Gram No. B51.

Coil Loading Hooks are very well described and illustrated in this booklet available from the F. J. Littell Co., 4127 N. Ravenswood Ave., Chicago 13, Ill.
Circle Inform-A-Gram No. B52.

Vertical Tube Expanding Machines that expand and size metal tubing by means of hydraulic powered expansion mandrels are described in a catalog sheet available from Walter P. Hill, Inc., 22183 Telegraph Rd., Detroit 19, Mich. General application data and operation information included.
Circle Inform-A-Gram No. B53.

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CIRCLE INFORM-A-GRAM KEY NO. III

New Technical Information on Delpark coolant filters for Besly grinders is now available. A folder put out by the Industrial Filtration Co., Dept. B-299, Lebanon, Ind., contains data on late model Besly machines and the Delpark filters offered as optional equipment.
Circle Inform-A-Gram No. B54.

Drill Chuck. The new May Automatic quick-change drill chuck is described in this bulletin. Copies are available to TOOLING and PRODUCTION readers from Kurt Orban Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Circle Inform-A-Gram No. B55.

High Temperature Alloys. Typical analysis, characteristics, applications, machining data and forging instructions on five grades of high temperature alloys are contained in this catalog available from Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Circle Inform-A-Gram No. B56.

Outstanding Features of two completely redesigned, dual control Shuster wire straightening and cutting machines are presented in Bulletin No. 37 V just released by Mettler Machine Tool, Inc., New Haven, Conn.
Circle Inform-A-Gram No. B57.

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Many manufacturers of pumps, compressors, valves and other equipment containing liquids or air under high pressures are now using production lapping to great advantage—have eliminated gaskets in mating surfaces, have improved product performance. This has been made possible through the extreme accuracy of work produced by the Lapmaster in production quantities. Micro-inch finishes of 2 to 3 RMS are common. Surface flatness can be held to less than .0000116".

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To determine whether lapping can be practical and profitable for you, we maintain a laboratory for lapping sample parts. If you believe it offers possibilities we invite you to send prints of the parts, together with surface finish requirements and production desired. In addition send several parts for test lapping. We can then give you the facts on what you can expect from the Lapmaster. There is no obligation for this service.

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Four Model 72" Lapmasters were installed in an automotive plant for lapping the joint faces on large castings. These Lapmasters are able to keep pace with the high production requirements of automotive plants because there is no downtime required for reconditioning the lapping plate. In addition, parts lapped by the Lapmaster can be brought directly from the milling operation to lapping. Intermediate grinding operations are eliminated. Still another important feature is the fact that joint faces are lapped so accurately, gaskets can be eliminated in final assembly; the resulting metal to metal contact also eliminates distortion caused by the conventional use of gaskets.

Additional Data

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CIRCLE INFORM-A-GRAM KEY NO. 112

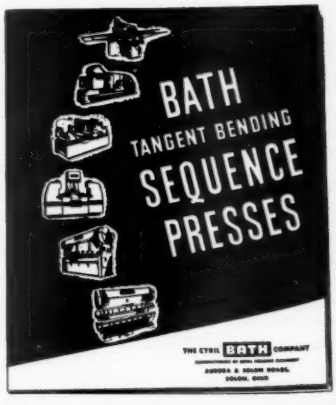
Broaching—past, present and future—is described and pictured in condensed form in the 35th anniversary issue of "Broaching News", just released by the Colonial Broach Co., Box 37, Harper Station, Detroit 13, Mich.
Circle Inform-A-Gram No. B58.

Die Steels for Cold Work. This publication details the uses, composition and heat treatment of die steels, and presents a thorough discussion of their metallurgical characteristics. It is available from the Vanadium-Alloys Steel Co., Latrobe, Pa.
Circle Inform-A-Gram No. B59.

Universal "Kwik-Switch" Tool Holders permit rapid tool changes for operations such as drilling, reaming, on boring mills and radial drills while maintaining accuracy and rigidity. Complete information is available from the Universal Engineering Co., Frankenmuth 7, Mich.
Circle Inform-A-Gram No. B60.

Speeds Up to and Exceeding 100,000 RPM are no barrier to Warren's vacuum high speed unit for testing rotating parts. Such items as fan impellers, turbine rotors, compressor rotors, accessory turbines and gyros are commonly subjected to the Warren testing method. This process also has been used to check the adherence of bond plating to various parts when rotated at high speeds and subjected to certain temperatures. Complete details of the testing technique used is yours for the asking in a brochure offered by Warren Bros. Mfg. Div., Warren Bros. Roads Co., 32 Potter St., Cambridge 42, Mass.
Circle Inform-A-Gram No. B61.

Tangent Bending. This new catalog describes the extremely important process of tangent bending which is a forming process. The booklet, just off the press, contains 28 pages. It shows many domestic



and industrial applications of this increasingly important phase of metal working. Your copy can be had from the Cyril Bath Co., Aurora & Solon Rds., Solon, Ohio.
Circle Inform-A-Gram No. B62.

Pictures, Brief Descriptions and specifications for each of its 12 basic types of machines are provided by the Colonial Broach Co., P. O. Box 37, Harper Station, Detroit 13, Mich., in a new bulletin (No. 877). Also described are the many broaching services provided.
Circle Inform-A-Gram No. B63.

Gears. A brief description of some of its facilities for producing fractional horsepower gears is contained in this brochure put out by Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill. Also included in the illustrated booklet is data on other gears made by the firm.
Circle Inform-A-Gram No. B64.

The New S22 Microfinish Comparator provides engineers, purchasing agents, designers, inspectors, machinists and quality control supervisors with an accurate comparator for typical machines surfaces. A brochure giving complete details is available from the Baptist Machine Co., Stanford, Conn.
Circle Inform-A-Gram No. B65.

Pneumatic Time Delay Relays. A complete line of solenoid-actuated pneumatically-controlled time delay relays is described in a new catalog, Bulletin SR-3, available from the A'G'A Division, Elastic Stop Nut Corp. of America, 1027 Newark Ave., Elizabeth, N. J. Included are mounting dimensions and wiring diagrams.
Circle Inform-A-Gram No. B66.

Hole Punching. This new catalog fully illustrates and describes Wales multiple hole punching system with Retainer Plate for punch assemblies. This method provides a simple, fast, safe, convenient and economical way to punch unlimited hole patterns in sheet metal parts. The catalog is available from Wales-Strippit Corp., 345 Payne Ave., N. Tonawanda, N. Y.
Circle Inform-A-Gram No. B67.

Power Shears. This new, illustrated catalog (No. 2011-E), covering Steelweld pivoted-blade power shears, has just been issued by the Cleveland Crane & Engineering Co., Wickliffe, Ohio. Dimensions and specifications are given for 31 different sizes of shears in the regular line, ranging from 6' by 10-gauge to 12' by one inch capacity.
Circle Inform-A-Gram No. B68.

Hydraulic Cylinders. A new bulletin (#800) that covers the standard line of heavy duty air and hydraulic cylinders in detail has been prepared by the Air and Hydraulic Division of the Lindberg Engineering Co., 225 N. Laflin St., Chicago 7, Ill. Descriptions of large special custom built heavy duty air and hydraulic cylinders are also included.
Circle Inform-A-Gram No. B69.

Reducing Production Costs with Aldridge soluble oils and other cutting and grinding fluids is the topic of discussion in a pocket-sized folder being offered by Aldridge Industrial Oils, Inc., 3401 West 140th St., Cleveland 11, Ohio.
Circle Inform-A-Gram No. B70.

Single Spindle Automatic. Just off the press is a 4-page illustrated folder describing a new 2½" model AW single spindle automatic made by the Cleveland Automatic Machine Co., Cincinnati 12, Ohio. New features and specifications are presented.
Circle Inform-A-Gram No. B71.

Simonds Saw & Steel Co., Fitchburg, Mass., presents a folder on its plants, factory branches and service stations. Illustrations on its many saw and steel products also included.
Circle Inform-A-Gram No. B72.

Modern Whiteprinting is the method for making positive copies from translucent originals. With this method it is possible to make exact duplicates in as little as 1 minute inexpensively. Read all about the process in literature available from Peck & Harvey, 5642 N. Western Ave., Chicago 45, Ill.
Circle Inform-A-Gram No. B73.

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DEPENDABLE . . . DURABLE
FIXTURE CLAMPS—widest range, in the industry, of sizes and types to fit every requirement.
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CIRCLE INFORM-A-GRAM KEY NO. 113

Mounted Wheels. A new 8-page catalog (No. 30) has been released by The Metal Removal Co., 1546 N. Orleans St., Chicago 10, Ill. It covers the firm's line of porcelain and resinoid bonded mounted wheels.
Circle Inform-A-Gram No. B74.

Gun Drill Data. A complete compilation of all of the latest information on the history and application of gun drills in industry is now available from the Eldorado Tool & Mfg. Corp., Milford, Conn. It is well illustrated with charts, drawings and photographs.
Circle Inform-A-Gram No. B75.

Relief Valves. Catalog sheets, showing construction, operating characteristics, dimensions, sizes and prices of pilot-type relief valves, are available from Fluid Controls, Inc., 1285 N. Center St., Mentor, Ohio.
Circle Inform-A-Gram No. B76.

The Field of Induction Heating is thoroughly covered by a series of brochures on the subject now available from the Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio. The publications in aggregate represents the firm's complete catalog on induction heating.
Circle Inform-A-Gram No. B77.

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SIZE	THREAD
4	32-48-50-64
5	30-32-36-48-80
6	36-40-48-56-60
7	32-40
8	24-30-36-38-40-44-48
9	24-28-32-40
10	28-30-36-40-48-64
12	20-28-32-36
14	20-24-28
1/16	60-64
5/64	72
3/32	48
7/64	48-56
1/8	32-40
5/32	32-36-40
9/64	36-40
11/64	36
3/16	20-24-32
13/64	32
7/32	24-28-32
1/4	18-24-26-27-30-32-36-40
5/16	16-20-22-27-28-32-40
3/8	12-16-18-20-27-28-32-36-40-48
7/16	12-16-18-22-24-27-28-30-32-36-40
1/2	12-14-16-18-22-24-26-27-28-30-32-40
9/16	16-20-24-27-28-30-32-40-48
5/8	12-14-16-20-24-27-28-32-36-40
11/16	11-16-18-20-24-27-28-30-32
3/4	9-11-12-14-18-20-24-26-27-28-32
13/16	10-14-18-20-32
7/8	10-12-16-18-20-24-27-28-32
15/16	8-9-10-12-14-16-18-20-24-32
1	10-12-16-18-20-24-27-32-40
1-1/16	12-14-16-18-20-24
1-1/8	8-10-14-16-18-20-24-32
1-3/16	8-10-12-14-16-18-20-24
1-1/4	8-10-14-16-18-20-24-32
1-5/16	12-14-16-18-20-24-32
1-3/8	8-10-14-16-18-20-24
1-7/16	8-10-12-16-18-20-24
1-1/2	8-10-14-16-18-20-24-28
1-9/16	18-20-24
1-5/8	5½-8-10-12-13-16-18-20-24
1-11/16	10-12-14-16-18-20-24
1-3/4	8-10-12-14-16-18-20-24
1-13/16	8-10-12-14-16-18-20
1-7/8	8-10-12-14-16-18-20-24
1-15/16	8-10-12-14-16-18-20-24-28
2	4-1/2-8-10-12-16-18-20
2-1/16	12-14
2-1/8	12-16-20
2-3/16	12-16
2-1/4	4-½-8-12-14-16-18
2-5/16	12-18
2-3/8	12-16-18
2-1/2	8-10-12
2-9/16	18
2-5/8	12-16-20
2-3/4	16
2-7/8	8-12-16
3	8-16
3-1/4	8-12-16
3-1/2	8-12-16
3-7/8	8
4	8-12

HIGH SPEED LEFT HAND TAPS

SIZE	THREAD
0	80
1	56-64-72
2	56-64
3	56
4	32-36-40-48
5	40-44
6	32-36-40
8	32-36-40
10	24-30-32-40
12	24-28-32
1/4	20-28-32
5/16	18-20-24-28-32
3/8	16-24-32
7/16	14-20-28
1/2	12-13-20-28
9/16	12-18-20-24
5/8	11-12-18-20-24
11/16	11-16-24
3/4	10-16-18-20
13/16	16
7/8	9-12-14-18-20
1	8-12-14-16-18-20
1-1/8	7-12
1-1/4	7-12-16-18
1-3/8	6-8-10-12-16-18-20-24
1-7/16	8-10-12-14-16-18-20
1-1/2	6-8-10-12-16-18-20
1-9/16	8-10-12-16-18-20
1-5/8	8-10-12-14-16-18-20
1-11/16	8-10-12-14-16-18-20
1-3/4	8-10-12-14-16-18-20
1-13/16	8-10-12-14-16-18-20
1-7/8	8-10-12-14-16-18-20
1-15/16	8-10-12-14-16-18-20
2	4½-10-12

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CIRCLE INFORM-A-GRAM KEY NO. 114

Presses. The Lake Erie Engineering Corp., P. O. Box 68, Kennmore Station, Buffalo 17, N. Y., has just published a new bulletin on hydraulic bending, straightening and plate forming presses.
Circle Inform-A-Gram No. B78.

Alloy Handbook. Composition, applications, form and properties of phosphor bronze. nickel silver, cupro nickel and beryllium copper are discussed in this booklet available from the Riverside Metal Co., Riverside, N. J.
Circle Inform-A-Gram No. B79.

Centralized Systems of Lubrication are the topic of discussion in a well-illustrated booklet (Bulletin No. 26) put out by The Farval Corp., 3295 East 80th St., Cleveland 4, Ohio. Featured in the brochure are cutaway views that show how the Farval Dualine measuring valve operates.
Circle Inform-A-Gram No. B80.

Chilling Chambers, in a low temperature, versatile line, for industrial metalworking, expansion fitting, metal stabilization, and low temperature research are presented in this folder. Available from the Harris Refrigeration Co., 365 Walden St., Cambridge, Mass., the circular also contains specifications.
Circle Inform-A-Gram No. B81.

Dual-Vane Hydraculic Pumps. The Dudco Div., New York Air Brake Co., 1700 E. 9 Mile Rd., Hazel Park, Mich., has just published a new 4-page bulletin (No. DP-300) which points out features and gives selection data for the complete line of Dudco Dual-Vane hydraulic pumps. Included are technical drawings, cutaway photos and performance data charts.
Circle Inform-A-Gram No. B82.

Metablast Process. The complete story of the newly developed Metablast process for controlled surface finishing is available in a 4-page bulletin issued by the American Metaseal Mfg. Corp., West New York, N. J. The folder depicts how a predetermined, consistent finish can be applied to metal parts through the use of a special abrasive suspension applied by means of air pressure.
Circle Inform-A-Gram No. B83.

This Case History Brochure covers the 4 standard sizes of Bodine machines, tooled for a variety of operations including drilling, milling, tapping, screw inserting and assembly. The operations completely described are production of parts for electrical, automotive, and other mass production industries as well as machines tooled for small-lot production shops. The brochure may be obtained from the Bodine Corp., Bridgeport, Conn.
Circle Inform-A-Gram No. B84.

Alloy Steel Plates. Advantages and applications of hot rolled alloy steel plates are contained in this Bulletin 905 available from W. J. Holliday & Co., 545 W. McCarty St., Indianapolis 7, Ind.
Circle Inform-A-Gram No. B85.

Saw Blades. Technite high speed band saw blades, power and hand hack saw blades are illustrated and described in literature being offered by The Capewell Mfg. Co., 65 Governor St., Hartford, Conn. Also included is a section devoted to the correct approach to a cutting job and how to operate a power saw.
Circle Inform-A-Gram No. B86.

New Welding Bulletin. "Welding With Ampco Bronze Electrodes-Filler Rod-Wire" is the title of the new 24-page Bulletin W-17 recently issued by Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 46, Wis. It describes the complete line of products for use with metal-arc, carbon-arc, inter-gas tungsten-arc, submerged-arc and inert-gas consumable electrode processes.
Circle Inform-A-Gram No. B87.

Non-Destructive, Radiographic Testing, the invisible "eye" of industry, is fast becoming an important tool for industrial inspection and process development. This brochure is offered as a brief outline of the scope of the tool. It is available from Industrial X-Ray, Inc., 220 Hempstead Turnpike, West Hempstead, N. Y.
Circle Inform-A-Gram No. B88.

Spray Nozzles. Here is a comprehensive 48-page booklet that illustrates and describes many standard and industrial spray nozzles. Complete data is listed covering the capacity and spray angle of each nozzle.

Dimensional specifications for all standard nozzles also are given. Copies of the new industrial Catalog No. 24 are available from the Spraying Systems Co., 3201 Randolph St., Bellwood, Ill.
Circle Inform-A-Gram No. B89.

Power Chucking Equipment. Catalog No. PO-64-1953 covers Cushman's complete line of air chucks, air cylinders and accessories. Address requests to The Cushman Chuck Co., Hartford 2, Conn. or—
Circle Inform-A-Gram No. B90.

For Arc Welding. Tweco Products Co., Wichita 1, Kansas, has just released a 12-page catalog covering its complete line of electrode holders, ground clamps, cable connectors and cable accessories for arc welding. Identified as the TWECOLOG No. 9, this colorful booklet includes consumer quantity prices.
Circle Inform-A-Gram No. B91.

Medium Pressure Die-Makers' Springs, in a new line, have just been introduced by the Producto Machine Co., Bridgeport, Conn. A one-page insert for Producto's #10 catalog describes and illustrates the new items.
Circle Inform-A-Gram No. B92.

Hydraulic Presses & Equipment. R. D. Wood Co., Public Ledger Bldg., Independence Square, Philadelphia 5, Pa., announces the recent publication of a new brochure on representative hydraulic presses and equipment manufactured by the company.
Circle Inform-A-Gram No. B93.

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the HALLMARK
of precision GAGE BLOCKS

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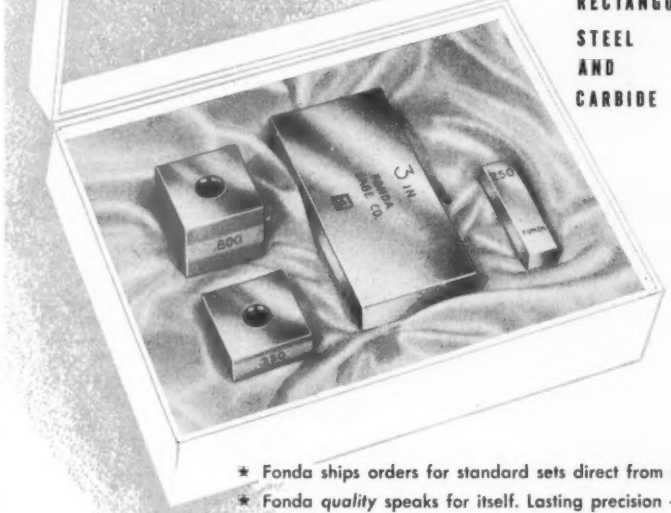

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CIRCLE INFORM-A-GRAM KEY NO. 115

Spray Booth Protector. Adhesive Products Corp., 1660 Boone Ave., New York 60, N. Y., announces the development of the Zipcote Spray Booth Protector. When applied to spray booths or turtables it prevents paint and adhesives from sticking to the walls of the booth.
Circle Inform-A-Gram No. B94.

Industrial Grinders. This general bulletin completely illustrates and describes Covel precision surface, universal cutter and tool and twist drill grinders. Available from the Covel Mfg. Co., Benton Harbor, Mich.
Circle Inform-A-Gram No. B95.

Drilling Units. Small hole drilling is speeded automatically and at low cost with Electro-Mechano compact drilling units. A bulletin (No. 1-109) put out by The Electro-Mechano Co., 260 Erie St., Milwaukee 2.
Circle Inform-A-Gram No B96.

Optical Pyrometer. This new catalog (No. 85) not only gives detailed information on the Pyro optical pyrometer, but also features technical notes on the principles of optical pyrometry, illustrations of applications and other interesting data. The Pyrometer Instrument Co., Inc., Bergenfield, N. J. offers the literature.
Circle Inform-A-Gram No. B97.

Latest development for production shops...

Automatically feeds coil stock as required without adjustment or operator attention!

Automatically feeds all types of coiled materials—wire or strip—to punch presses, shears, slitters, forming rolls, etc.

Supplies stock only as machine needs it! Motor operates intermittently by means of slack loop control.

Adjustable Timer—Provides a shut-off delay after motor switch is tripped. A slack loop of predetermined length is then formed from which forming machine can draw.

Adjustable width control—Reel space is quickly adjusted to accommodate varying roll sizes by rotating a crank. Steel guide plate is moved laterally by three lead screws, simultaneously driven by roller chain.

Reversible motor—Operates in either direction for feeding or rewinding stock. Reversing switch is supplied as standard equipment.

Easy loading—Slack loop actuating bar lifts up, exposing entire reel area. Coils are rolled up ramp, eliminating all lifting.

4 power driven rolls, linked by roller chain insure positive reel drive. Rolls are heat-treated for maximum life.

Anti-friction pillow blocks—Power rolls and back-stop roll are mounted in cast iron pillow blocks, each equipped with roller type needle bearings for long life and trouble-free operation. Alemite fittings permit easy lubrication.

See your dealer or contact Benchmaster Manufacturing Company 1835 West Rosecrans Avenue, Gardena, Calif.

The Benchmaster Koil Kradle is designed to fulfill a wide variety of feeding problems. It automatically supplies a slack loop of material feeding any machine from the slack loop rather than from the weight of the coil. Material fed over the actuating bar triggers a micro-switch as the slack loop tightens. The power rolls then rotate the coil, forming a new slack loop; correct loop size is uniformly maintained for any machine requirement, with no attention from the operator! Standard coil speed, continuous operation, 90 feet per minute.

THREE SIZES

Model	Load Capacity	Roll Width	Roll Diameter	Motor h.p. & phase*	Approx. Shipping Wt.
310	1200 lbs.	10"	36"	¼ h.p. single phase	302 lbs.
313	1200 lbs.	13"	36"	110 V ac ball bearing,	310 lbs.
315	1200 lbs.	15"	36"	capacitor type. (3 phase available)	328 lbs.

*All motors reversible, reversing switch supplied as standard equipment.

benchmaster World's largest manufacturer of small punch presses and mills.

CIRCLE INFORM-A-GRAM KEY NO. 116

Cast Thermoset Plastic Sheets. A new 12-page catalog describes and illustrates applications of clear cast thermoset "Cocor" sheets. Unusual properties such as high abrasion and heat resistance, toughness and complete solvent resistance are featured. The bulletin is available from the Cast Optics Corp., Riverside, Conn.
Circle Inform-A-Gram No. B98.

Strip Metals. A new 6-page, illustrated brochure describes a single source for a wide variety of thin gauge and close tolerance ferrous, non-ferrous and precious strip metals. Especially interesting is a list of thickness tolerances that can be held on beryllium copper strip. Write to Industrial Division, American Silcer Co., Inc., 36-07 Prince St., Flushing 54, N. Y., or—
Circle Inform-A-Gram No. B99.

Air-Gage Tracer. This is a versatile unit that makes a Monarch lathe quickly convertible into a production machine for straight or contour turning, boring or facing. You can learn all about this new cost-reducing tool in Booklet No. 2607 now available from The Monarch Machine Tool Co., Sidney, Ohio.
Circle Inform-A-Gram No. B100.

Case Histories tell how Honan-Crane filtration equipment has solved coolant clarification problems at two large metal-working plants. Prepared by Honan-Crane Corp., Lebanon, Ind., both bulletins contain actual plant photos as well as schematic drawings of coolant systems in operation.
Circle Inform-A-Gram No. B101.

Industrial Clutches. A new bimonthly bulletin of case histories, technical features, and news in the field of industrial clutches is now available from the Formsprag Co.,

23601 Hoover Rd., Van Dyke, Mich. Well illustrated with photographs and diagrams, it covers all three types of clutch application; overrunning, indexing and backstopping.
Circle Inform-A-Gram No. B102.

Cemented Carbide Products are described and illustrated in a brand new catalog (No. 54) now offered by Kennametal, Inc., Latrobe, Pa. This

booklet contains information and technical data on dies, tool blanks, chip breakers, etc. It also includes prices, ordering hints, special tool features and applications.
Circle Inform-A-Gram No. B103.

Kellerflex Carbide Burs have a wide range of application in all industries because of their long life, rapid stock removal, versatility, and many different shapes and sizes. They provide a fast and economical way of cutting hardened steel or soft materials from hard-to-reach corners and cavities and can be used in powered hand tools and stationary machines. Brand new 1954 literature that provides a well-illustrated and written presentation of these Carbide Burs is available from Pratt & Whitney, Division Niles-Bement-Pond Co., Hartford 1, Conn.
Circle Inform-A-Gram No. B104.

Shear, Slitter Knives. A handsomely bound handbook on shear knives and slitter knives is available to TOOLING and PRODUCTION readers. It is published by the American Shear Knife Co., Homestead, Pa. The highly-informative booklet provides a single source of basic information on the use and maintenance of she knives and slitter knives. It is especially valuable to users in mills and fabricating plants.
Circle Inform-A-Gram No. B105.

Heat Treating Furnaces for industry are well illustrated and described in Bulletin 653 put out by the Hevi Duty Electric Co., 4212 W. Highland Blvd., Milwaukee, Wis. Featured in the brochure are retort electrical furnaces for simplified control of the carbon case and Hevi Duty pit-type convection furnaces for tempering, drawing, annealing and hardening.
Circle Inform-A-Gram No. B106.

Dial Indicator Contact Points are ably described in new literature now available from the Precision Supply & Machine Co., 12-36 River Rd., Fair Lawn, New Jersey.
Circle Inform-A-Gram No. B107.

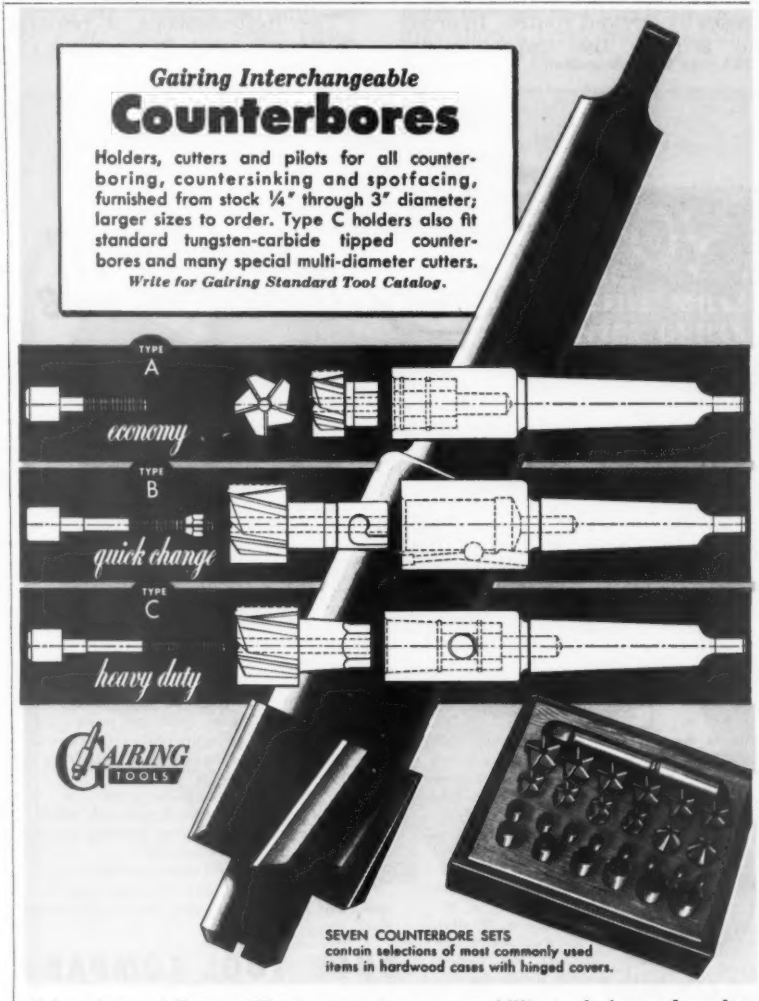
Heavy Duty Lathes. This attractive brochure puts on display several models of LeBlond heavy duty lathes. The booklet covers machines from 16 up to 40 inches. Illustrations and specifications included. The literature is available from The R. K. LeBlond Machine Tool Co., Cincinnati 8, Ohio.
Circle Inform-A-Gram No. B108.

New Schrader 4-Way Valves are primarily designed for operation of double-acting cylinders. Complete details on the valves are presented in a circular available from A. Schrader's Son., Div. of Scovill Mfg. Co., Inc., 456 Vanderbilt Ave., Brooklyn 38, N. Y.
Circle Inform-A-Gram No. B109.

Industrial Trucks. A new and revised condensed catalog that covers electric-driven industrial trucks has been published by the Automatic Transportation Co., 149 W. 87th St., Chicago 20, Ill.
Circle Inform-A-Gram No. B110.

Gairing Interchangeable
Counterbores

Holders, cutters and pilots for all counterboring, countersinking and spotfacing, furnished from stock ¼" through 3" diameter; larger sizes to order. Type C holders also fit standard tungsten-carbide tipped counterbores and many special multi-diameter cutters.
Write for Gairing Standard Tool Catalog.



SEVEN COUNTERBORE SETS contain selections of most commonly used items in hardwood cases with hinged covers.

Although we at GAIRING like to prove to you our ability to design and produce special production tooling, don't come to us for the tough jobs only • The counterbores shown here, with various holders, the standard back spotfacers and core drills, are real quality production tools made by us for 35 years. Better write us today for the GAIRING Standard Tool Catalog and Price List.

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CIRCLE INFORM-A-GRAM KEY NO. 117

USE OF ELECTRONIC METHODS AND INSTRUMENTS PROVIDE BOTH SAFETY AND PRODUCTION BENEFITS

by W. A. Black
Chief Electrical Eng.
Steel and Tubes Division
REPUBLIC STEEL CORPORATION
Cleveland, Ohio

OPERATING MANAGEMENTS are often reluctant to approve expenditures which are based on safety alone. No safety engineer, on the other hand, can make positive assurance that any expenditure of money will be an absolute guarantee against the occurrence of an accident. For that reason the modern safety engineer must sometimes accomplish his purposes by devious routes. In order to acquire the improvements which he feels will be a step forward in the safety program, he must also develop statistics on the production benefits that will be associated with the new safety device or method.

The Reflectoscope, a remarkable instrument, is a notable example of how safety and profit can be related. It is so vital to a safety program in heavy industry that sales on the basis of safety alone might justifiably be expected to constitute a large part of the Reflectoscope business. This however, is definitely not the case. Probably 90% of the 600 Reflectoscopes that have gone out into industry were sold primarily on their potential earning power in operating and maintenance.

Many of these purchases, however, have resulted in raising the safety level in operations to which they are applied, in spite of the fact that they were not bought primarily for that purpose. Probably the most impressive illustration of my point to be found anywhere in industry is the inspection of a huge engine, by the Reflectoscope, in the Cleveland district of the Republic Steel Corporation last year. A 25,000 HP steam engine, the very heart of a tremendous steel district, the bottleneck through which steel must flow at the rate of over 150,000 tons per month, was under suspicion.

Weekly inspections with the Reflectoscope had been established as routine procedure to avoid breakdowns of the engine and the loss of production. Elevation of the safety level in the plant and prevention of bodily injury to personnel were, initially, of secondary importance.

The engine had at first appeared to be in excellent condition. The maintenance crew had performed its usual inspection routine. Bearing caps had been removed, alignment checked, and wear measured. Nothing appeared to be amiss even to the experienced eyes of the crew and the stationary engineer. But the ultrasonic test, the last step in the checkup, showed that deep in the heart of the engine, trouble was brewing. The long sensitive fingers of the Reflectoscope revealed the presence of two stress cracks (in the crankpin of the crankshaft). The cracks were in a location that was completely covered by the crank-throw and

This paper is published through the courtesy of the National Safety Council. Production executives will recognize many potential areas for elimination of work stoppages and lost man-hours that exist in their own plant.

YOU SAVE
Every Time You Use
Buck
AJUST-TRU
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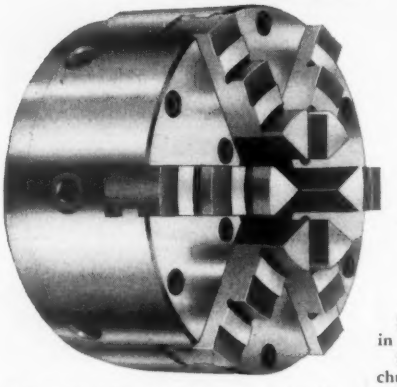
CHUCKS



This is the only universal scroll chuck with .0005" precision. It is used on lathes, grinders, dividing heads, screw machines. Does most of work formerly requiring stub arbors, mandrels, special fixtures.

6 JAWS

OR 3 JAWS

3-jaw and 6-jaw models in 4", 5", 6", 7½", and 9" sizes. 2-jaw Aviation chucks, for holding odd shaped parts in 6", 7½, and 9".

Save machinists' time — lines up dead true in *one* minute, without shims . . .
Save operators' time — holds .0005" rechucking precision on duplicate parts . . .
Save collet and step-collet costs — the AJUST-TRU does the work of hundreds of dollars worth of collets . . .
Save distortion on tubular work . . .
Save scratches on ground, polished, work . . .
Save time and expensive holding fixtures on many grinding operations . . .
Save chuck wear — it takes up wear in use . . .
More than ever today, you need the economies of Buck chucks. Send for latest catalog.

BUCK TOOL COMPANY
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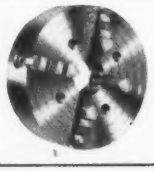

NEW SUPER-GRIP 4-JAW
INDEPENDENT CHUCK FOR 9" to 16" LATHES
Most chucks for 9" to 16" lathes are either too light and cheaply made to hold work securely, or too heavy for the lathe and clumsy to handle. Here's the happy medium — a chuck with ideal weight, providing much more "holding power" from its ⅛" larger diameter, finely threaded screws. Also eliminates ⅜" overhang . . . improves accuracy . . . permits heavier cuts. 6", 8" and 10" models. Send for latest catalog.

CIRCLE INFORM-A-GRAM KEY NO. 118

was therefore not susceptible to visual or surface inspection. Of all the test methods available to the mill maintenance men, the only one that had a chance of finding these harbingers of disaster was the ultrasonic test.

The initial test indicated that the defective areas were so small that they would probably not be dangerous. Because of this the mill was continued in operation and tests taken every day. As operations were continued, the defects grew in size and finally appeared to be large enough to justify removal of the crankshaft. The crankshaft was taken to the plant of the engine manufacturer where the pin was removed. The alloy steel pin was about four feet long and two feet in diameter. It was finally broken and revealed defective areas at exactly the points indicated by the Reflectoscope. If these defects had not been detected and removed, breakage of the pins could have unleashed an explosion of screaming steam and flying steel of devastating magnitude. Many casualties could have resulted. Crippled production, increasing losses, and general confusion would have ruled the scene for many weeks.

Another unique development which had to follow devious routes to accomplish the objective of the safety engineer is a device which we have labeled the Autopour. In spite of many major accidents and obvious steel losses in pouring molten steel from the ladles into the ingots, no major improvement had been made in the safety of the pouring operation in the 30 years preceding the introduction of the Autopour.

To a safety engineer thoroughly steeped in the urgency of safe practices, a remote control that would enable the pourer to stand 20 or 30 feet away from the ladle would seem an operating necessity.

Resort to an analysis of the potential economies in operation was the key to progress. Tests revealed that, in addition to improving the safety level of the operation, the remote control or Autopour also reduced the splashing, reduced the loss of steel when moving from mold to mold, and also provided a better guarantee of maintaining free movement of the stopper in the presence of a solidified crust on the top. These conditions set the stage for the safety engineer to accomplish his objective by using an indirect line of argument.

Electronic devices have also played an important part in increasing the safety with which large industrial cranes are being used. In all industries in which heavy materials are handled by cranes, almost all of us at one time or another demonstrate tremendous faith in the solidity and strength of the crane hooks—merely by stepping out into the operating areas. In many cases, even though we may not be directly under the load of the crane, we are close enough to it that failure of the crane hook could result in serious personal injury. Many permanently damaged bodies can attest to the fact that our faith in the strength of the crane hooks is not always justified. In the past few years electronic equipment combined with Magnaflux powder has been used to forestall accidents. A crane hook which to the naked eye appears to be perfectly sound, when dusted with magnetic powder in a magnetic field may show a crack readily visible

. . . Continued on Page 122

For . . . TAPS
STEP CUTTERS
BORING TOOLS
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CENTER DRILLS
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Inter-changeable collets up to 1.125" D.
Preloaded ball bearing spindle.
Easy-to-read settings. Easy to set up.
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What a relief!
More Cuts Per Grind
Better — Freer Cutting
Reduce perishable tool costs with this preferred grind on your straight and spiral flute production cutters — Easy and fast as ordinary angular relief grinding.
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Problems Of Administration And Supervision In The Automatic Factory*

by G. H. Gustat

IF WE CAN DEFINE automation or the automatic factory as one in which some of the processes or operations are automatically controlled or partially controlled, then we are perhaps nearer to the present status of automation in our factories.

After the first world war, the increasing demands for chemical products were such that the old batch methods could not meet them, and we witnessed a change to a continuous form of production. This trend has continued to the present time.

The mechanical and hand operations tend to follow this same pattern but have not advanced as quickly as the chemical processes.

This trend has resulted in the American workers gaining more wealth, simply because they produce more wealth; and, they are able to produce more because these modern tools and methods of production have multiplied their strength enormously. Today, each of these workers is the boss of an invisible crew of mechanical men, whose energies he commands at the flick of a switch, and whose productive efforts enrich his life.

The descriptive adjectives come and go—"mass production", "technocracy", and new "automation". But broadly, they mean about the same thing. A hundred years ago, the average American worker had about $500 worth of tools at his disposal. Today, however, he must use as much as $100,000 worth of tools and machines in some of our largest industries.

These changes have generally resulted in lower costs, improved and new products, safer operation—and more supervisory or administrative headaches.

Top management must continue to have the faith to invest in new and improved equipment that will produce more and more wealth which, in turn, raises our standard of living and provides continuing employment for greater numbers of people. It is not always easy to have that kind of vision or to sell it to conservative boards of directors and stockholders.

It is easy to be fascinated by the thought of automatic machinery, sometimes to the point of where it is not adaptable or will not pay for itself and where a much simpler method might improve the job without a large capital investment.

The burden of timing changes so as to prevent displacing labor by absorbing them in increasing production schedules, falls upon

*Form a talk delivered before the 1953 Annual Meeting of the American Society of Mechanical Engineers, and reprinted through the courtesy of the ASME.

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GEAR CHECKER
• INEXPENSIVE
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THIS SPECIAL MODEL CHECKS GEARS FROM 1/8" P.D. to 24" P.D.
CAPACITY 0 to 6" P.D.
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HERE ARE THE 14 CHECKS YOU CAN MAKE WITH THE VARIOUS ORLANDI MODELS
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3. Root diameter of spur, helical or worm gears
4. Outside diameter—Odd number or even number of teeth
5. Crown or taper condition of spur or helical gears
6. Direct check with mating or master gears using rolling attachment
7. Outside diameter of gear blanks
8. Parallelism of spur gears
9. Helix angle of right or left hand gears
10. Tooth spacing—tooth to tooth
11. Tooth spacing—at 180 degrees
12. Backlash with rolling fixture or pins
13. Pitch diameter with three wires of thread, any form
14. Plugs, arbors, precision parts, as a comparator
CHECKS THREE FACTORS AT SAME TIME WITH ONE SET-UP
A
Tooth spacing, pitch diameter and concentricity.
B
Parallelism, pitch diameter and concentricity.
C
Helix angle, pitch diameter and concentricity.
All Checks Are Set Up By Gage Blocks, Alone, No Master Gears Being Necessary.
ORLANDI GEAR & MACHINE COMPANY
Manufacturers of Precision Gears
16195 MEYERS ROAD • DETROIT 35, MICHIGAN
CIRCLE INFORM-A-GRAM KEY NO. 120

this (top management) group. There is a tendency for this group to reach a frame of mind that the automatic machinery, once in, will solve all the problems. No matter how automatic the equipment is, it is still necessary for someone to have the incentive to want to make it run effectively.

There was a time when the best workman usually became the foreman when a vacancy occurred. Questionable or not, as long as the operation was simple and unmechanized, the man usually had enough background to understand and direct the job.

When you get operations that are controlled by (complex) instrument panels, it is highly desirable to have considerably more background in your supervision. With careful planning, technically trained men can be worked into the line over a period of time.

Complex equipment has meant that the employee must have better basic knowledge of machinery and electrical controls, for this is the day of the "Micro switch and electronic tube."

All of this affects people on the job in yet another way. One of the fundamental urges in a person is the desire to accomplish something and the more tangible it is, the better. On the old hand operations, an employee had a measure of satisfaction for this urge in that he saw physical proof of his effort. In the automatic operation, it is not unusual for him never to see the product he finishes. Boredom on such jobs can be high.

If one part of the equipment goes down, usually other operations are affected and manufacturing cost increases can be serious. If such equipment is to be kept running a high percentage of the time, and producing good product, a sense of accomplishment must be provided for the operating and maintenance personnel.

One way of providing this is to measure the productivity of the job or operation and to provide an index to tell operators how well they are accomplishing your objective. The measures, used like any other, must be carefully set and easily understood. They may be continuous operation of the equipment for the maximum scheduled run time, waste percentages, yield factors, or combinations of any of these items.

Normally, management and supervision tend to think of incentives in terms of the amount of physical work accomplished. We do not like to call this "productivity measure" an "incentive system" for that reason. It is just the reverse of the usual incentive plan in that, when the operators are doing the least amount of work, they are operating at the highest effectiveness. When they are working, it means that something is wrong and the automatic process has either stopped or is not operating efficiently.

It has not been unusual to step operating effectiveness on automatic equipment from 60 or 70% up to 90 or 105%. When the value of the product produced is worth a great many times the total value of the labor used, this type of measure returns even greater cost reductions than measurement of hand work.

When you "SAVE"...
YOU LOSE!
"Saving" by making your own punches is old-fashioned and expensive.
Here's why:
1. PORTER PUNCHES are available for immediate delivery.
..... they save time — money — by keeping your expensive help at profitable jobs.
2. PORTER PUNCHES are made to "stand the gaff."
..... punches made in your shop are probably made from "available" material ... often the wrong metal for the job.
3. PORTER PUNCHES are offered in standard—and decimal sizes.
..... so your experienced help doesn't spend costly time "whittling."
4. PORTER PUNCHES are reasonably priced.
..... only a "specialist" can make punches as well—or as inexpensively.
Check your labor costs — your "down-time"— and order
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— for immediate delivery.
Save time — save money, — with top quality punches and die buttons.
Look to Porter for
the punch you need... when you need it!
Remember — you don't save by making your own punches — you lose.
"Still the best performer"
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Cincinnati 15, Ohio
Porter Punches are in stock in all principal cities.
CIRCLE INFORM-A-GRAM KEY NO. 121

. . . Electronics, from page 119

to the inspector.

Electronic devices have also been used to good advantage in the inspection of racks commonly used for storing bars and tubing. Because of the nature of the business, these storage racks are frequently roughly handled and overloaded. In our Cleveland plant we use a loading rack of our own design for stacking heavy gauge tubing. Unfortunately, racks are sometimes mishandled and subjected to abuse far exceeding the normal loads. As a result of this, one of the racks failed and the load of tubing fell to the floor.

Because of this experience our electronic non-destructive test men investigated the problem immediately. All of the storage racks, many of which had been in service for 10 to 20 years, were checked for cracks by both the magnetic powder method and the liquid "Spotcheck." All of the welded joints or corners were inspected by this method. Many of them were found to be cracked in the critically stressed areas. They have been removed from service and, based upon the knowledge obtained by electronic non-destructive test, the design has been changed to reduce the probability of cracking.

LESS SPACE!
extra high safety factor!
NEW T-J
Spacemaker
AIR CYLINDERS
These new T-J Cylinders save up to 40% in mounting space—with streamlined design that eliminates tie rods. They're super rugged—extra high safety factor . . . solid steel heads . . . heavy wall, precision honed, hard chrome plated, seamless steel body . . . leakproof cylinder head to body construction . . . heavy duty, hi-tensile, hard chrome plated piston rod.
Available with the new T-J Super Cushion Flexible Seals which insure positive cushion with automatic valve action for fast return stroke. Many standard sizes and styles . . . for pushing, pulling, lifting, clamping or control jobs. T-J dependability. Write for bulletin 8152. The Tomkins-Johnson Co., Jackson, Mich.
CIRCULAR HEADS WITH TIE RODS
SQUARE HEADS WITH TIE RODS
T-J T-J T-J
SPACE SAVED
T-J SPACEMAKER . . . provides additional room for adjacent equipment without sacrificing strength.
4 Weeks Delivery on the Spacemaker — any style, any stroke, 1" to 3" diam.
T-J
TOMKINS-JOHNSON
37 YEARS EXPERIENCE
CIRCLE INFORM-A-GRAM KEY NO. 122

A unique instrument which has not yet been put on the market but which will ultimately become a vital factor in electronic non-destructive testing for safety is the Seam Depth Indicator. The Seam Depth Indicator was developed by Republic Steel Corporation for the purpose of determining the depth of a crack in a metal object. While many instruments on the market are capable of indicating the presence of a crack, none of them can indicate how far the crack extends into the base metal. The Seam Depth Indicator does just that. Because of that ability it can differentiate between what might be simply a surface scratch and a defect that is genuinely dangerous.

A high pressure steam boiler header had been condemned by the boiler inspector because he had observed cracks in the 1½" plate from which the header was made. The cracks however, were tightly closed and as mentioned above it is impossible for any observer to tell how deep such cracks are. On the basis of this argument, the boiler inspector was persuaded to observe the use of the Seam Depth Indicator. The instrument revealed that the cracks were extremely shallow varying between 0.005" and 0.010". Grinding out some of the cracks and measuring the depth by a depth micrometer confirmed the indications of the instrument. When sufficient cracks had been ground to convince the inspector of the accuracy of the instrument, he approved the boiler on the basis of the instrument's performance.

Another use of the Seam Indicator which indirectly has an important bearing on safety is pipe coupling inspection. Steel pipe manufacturers usually sell couplings with the pipe. The pipe is subjected to a high pressure internal hydrostatic test. The couplings are usually not tested, but the manufacturer is faced with the possibility of having to test the coupling hydrostatically. This would be an expensive and potentially dangerous operation. The Youngstown plant of Republic Steel Corporation has been using the Seam Depth Indicator to determine the depths of seams and has found it an entirely satisfactory

method of inspection. This method has the safety feature of eliminating the potentially dangerous high pressure hydrostatic test of short pieces.

Another electronic test that is rapidly coming into its own is the determination of the wall thickness of tubes and pipes by ultrasonic devices. Three such devices are on the market—The Sonizon, the Audigage, and the Reflectogage. One instance of the use of this instrument may be of special interest. In the case of tanks that are filled with liquid, drilling would be impractical. Determination of such critical thicknesses is valuable to both the maintenance superintendent and the safety supervisor.

Among the electronic devices whose safety significance has not been recognized as widely as it should be, are special telephones to operate between moving vehicles of all kinds.

Here again the safety engineer has a splendid opportunity to use the many potential economic advantages as a crutch to help him achieve his safety objective. Efficiency in production is often directly proportional to efficiency of communication.

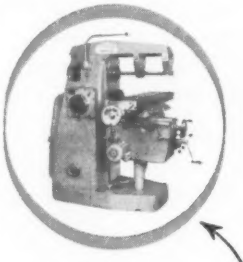
Some new, modern electronic equipment being introduced into industrial operations requires special attention from safety personnel to make sure that the electronic equipment itself is not harmful to the operator or to the men working in its vicinity. In this category are instruments using x-ray and radioactive isotopes. In the majority of cases the tendency is to over-estimate the hazard associated with the use of these devices, but in some cases the stray radiation is great enough that special precautions must be taken.

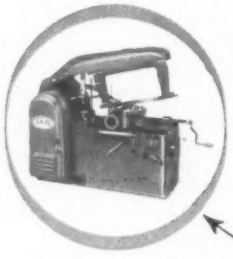
It is the function of the safety engineer to make sure that a reliable authority on the subject has made a thorough survey to determine the extent of dangerous radioactivity, if any. At Republic Steel Corporation our practice has been to retain an authority on radioactivity and its biological effects to make a complete survey of the vicinity of the installation. He then explains to the supervisors and men who are likely to be in the area what is involved in exposure to radioactivity and the extent of hazard if any. If the hazard is appreciable, it is desirable to have the usual warning signals, fences with gage-controlled order to warn people that they are in a hazardous area.

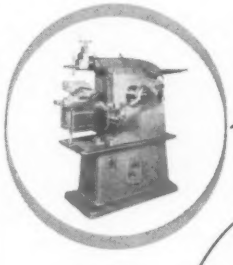
While the present and potential uses of electronic devices are extensive, it should always be borne in mind that as a rule the electronic method should be used only if other methods are not available or if other methods have failed. In our experience, the number of problems that can be solved by electronic devices, and electronic devices only, is large enough to make electronics an important tool in our operation. However, the aura of glamour surrounding electronic work is still so attractive that some people have tendencies to use electronic devices when simpler methods will accomplish entirely satisfactory results.

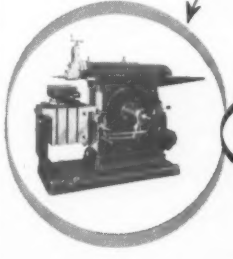
If, however, they do find the electronic method the only solution to their problem, they can often put it across with greater success if they will take the trouble to analyze and report to the operating superintendent the many economic advantages that are frequently associated with the safety improvement in question.

Swedish Craftsmanship!









headquarters

FOR THE FINEST
SWEDISH MACHINE TOOLS

Austin is American headquarters for the fine machine tools that are manufactured in the modern Swedish machine tool center of Värnamo.

Built with the painstaking workmanship and quality materials that characterize Swedish products, these machine tools, since their introduction in the U.S.A., have earned an enviable reputation for accuracy and dependability in toolroom and production line. All machines comply fully with U. S. Standards.

SAJO #2 ALL GEARED MILLING MACHINES — plain and universal models — light and standard types, all built to modern design to meet industry's demand for fast, simplified operation while maintaining maximum accuracy. Available with longitudinal power feed only or with power feed and rapid traverse in all directions. Offered with full line of accessories.

SAJO HYDRAULIC HACKSAWS — Utility and Production Models — 6" x 6", 9" x 9" and 10" x 10" capacities. These sturdy machines, for intermittent or production duty, have unique patented features and are attractively priced. Sajo Hacksaws represent exceptional values in cutting off equipment.

PREMA 13" SHAPER — a "mighty mite" — ideal for applications where large shapers are not justified. "Big Shaper" performance and accuracy at modest cost makes the Prema a profitable addition in the toolroom or on light production work.

VMA SHAPERS are available in both standard and heavy duty models — 14" to 26" length of stroke. These rugged amply powered machines provide speedy set-up, ease of operation and maximum stamina in the toolroom or production line. Automatic lubrication and table power rapid traverse are standard on heavy duty models. Universal table and other accessories are available.

Service and spare parts available from us or from our dealers in principal cities.

For complete details, illustrated catalogs and information as to reference installation in your vicinity write to

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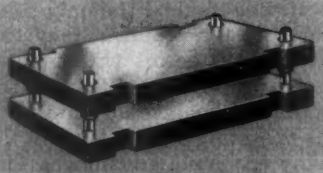
76-X MAMARONECK AVENUE, P. O. BOX 430, WHITE PLAINS, N. Y.

Look for the Austin Seal — your full guarantee of satisfaction.

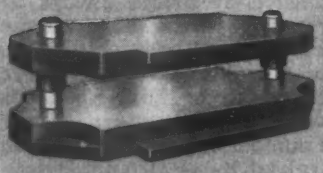
CIRCLE INFORM-A-GRAM KEY NO. 123

Specify DETROIT
for any type of die set



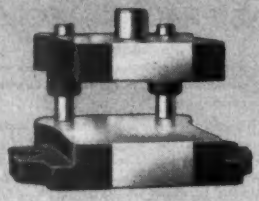
***Special* ALL-STEEL**
DIE SETS

. . . any type or size of die set, factory-built, factory-assembled and factory-tested to meet the most exacting specifications.



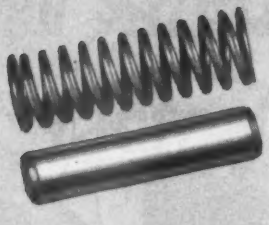
***Special* SEMI-STEEL**
DIE SETS

. . . using premium castings, formulary-controlled for high tensile strength, good machining qualities and exceptionally long life.



***Stock* PRECISION**
& COMMERCIAL SETS

. . . both types available in regular, long narrow and reverse styles in all standard sizes, ready for immediate shipment.



***Precision*-BUILT**
ACCESSORIES

. . . a wide range of high-quality supplies, built to Detroit's precision standards, ready for immediate shipment.

Detroit
DIE SET
CORPORATION

Call "Detroit"

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DETROIT 2, MICHIGAN

DETROIT	TR 2-5150	FLINT, MICH.	3-7361	NEWARK	MA 2-4318
BALTIMORE	PL 2-4641	GRAND RAPIDS, MICH.	3-1893	NEW ORLEANS	RA 6528
BIRMINGHAM, ALA.	3-1341	GREENSBORO, N.C.	4-7655	ORLANDO, FLA.	2-3747
BUFFALO	CI 0163	INDIANAPOLIS	HU 5604	PHILADELPHIA	VI 4-4084
CHICAGO	PU 5-0800	KANSAS CITY, MO.	VI 3558	PITTSBURGH	LO 1-4011
CINCINNATI	HU 7775	LOS ANGELES	AD 7251	ROCK ISLAND, ILL.	8-2814
CLEVELAND	TO 1-0860	MILWAUKEE	GL 3-7170	ST. LOUIS	FR 6811
DALLAS	TE 5029	MINNEAPOLIS	OR 5-7980	SEATTLE	EL 6644
DAYTON	HE 3042	MONTREAL, CAN.	GL 6126	TOLEDO	MA 4510
DECATUR, ILL.	8-3474	NASHVILLE	6-2597	TORONTO, CAN.	KE 2972
DENVER	SH 2451			WASHINGTON, D.C.	AD 4-5700

CIRCLE INFORM-A-GRAM KEY NO. 124

. . . Record, from page 87

without appreciable loss of the controlling signal.

The record-playback equipment possesses certain inherent advantages over existing methods of automatic machine and process control, because it offers complete co-ordination of all machine or process variables such as continuous control of feeds to produce desired contours—multiple passes if required, change of spindle to suit desired machining conditions at any time, and synchronization of many other functions of the cycle.

Operator know-how can be incorporated into the recorded automatic cycle for such things as compensating for backlash, taking care of machine inaccuracies, spindle deflections, tool loading, and so on.

The control makes possible high production economies for low or medium production jobs, because automatic and semi-automatic cycles can be used where they formerly were impractical. Minimum set-up time is required changing from one automatic cycle to a totally different cycle since only the record tape and tools need changing.

Speed, accuracy, tools, procedures, and other variables are all dependent upon the application to which the control is put.

The equipment itself consists of two components: the magnetic tape recorder and the electronic control panel. Both are enclosed in a cabinet about the size of a large wardrobe closet. Weight is approximately 1900 lbs. and power requirement is standard.

A Unique Boring and Facing Jig

To speed boring and facing operations on electric motor frames, a new type jig has been developed and constructed by Lusk, Incorporated, for Electra Motors, Inc., both of Anaheim, Calif.

The new jig was designed to handle N.E.M.A. No. 66 frames, both standard or footed types, for motors with capacities ranging from one-half through one horsepower. This jig is part of Electra Motors' tooling program for production of these sizes. The jig is split into two-parts with

. . . Continued on page 128

Put the WALES Fabricator through its paces at your plant!

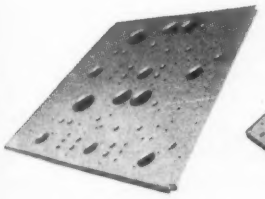
Showing *Wales Fabricator* in new mobile unit for demonstration at your plant. See it operate at your plant before you buy any other type of hole punching, notching or nibbling equipment.

Showing Wales *Trw-Edge Shear* for circle and shaped cutting, beading and forming in the new mobile unit. Material is sheared, not punched.

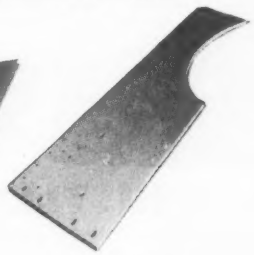
Above new Wales-Strippit mobile unit (1 of 3) brings the Wales Fabricator right to your plant. You and other plant executives can use this unique Wales Fabricator to produce your own parts. Your time study men can evaluate its astounding money-saving , cost-saving efficiencies.

The Wales Fabricator is the only machine of its kind and is designed for rapid interchangeability for punching, notching and nibbling. Work from blueprints or operation sheets . . . no *templates required.* Can you match the Wales Fabricator time studies below?

See for yourself. Operate it. Put it through its paces. Write today for Wales Catalog 10-AA and an appointment for a demonstration at your plant.



An electronic chassis, 12⅛" x 11⅜" with 118 holes and 4 notches was completed including setup in only 32.45 minutes and subsequent pieces in only . . . . . **0.44 MIN.**



A part of a piece of farm equipment 72⅛" x 22" with 32 holes and nibbled cut-out was finished including setup in only 12.01 minutes, subsequent pieces in only . . **2.32 MIN.**

WALES-STRIPPIT CORPORATION

GEORGE F. WALES, *Chairman*

355 PAYNE AVE., NORTH TONAWANDA, N. Y.

(Between Buffalo and Niagara Falls)

WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONTARIO

Specialists in Punching and Notching Equipment

CIRCLE INFORM-A-GRAM KEY NO. 125

MEN YOU SHOULD KNOW . . . . . .

A. J. Snyder

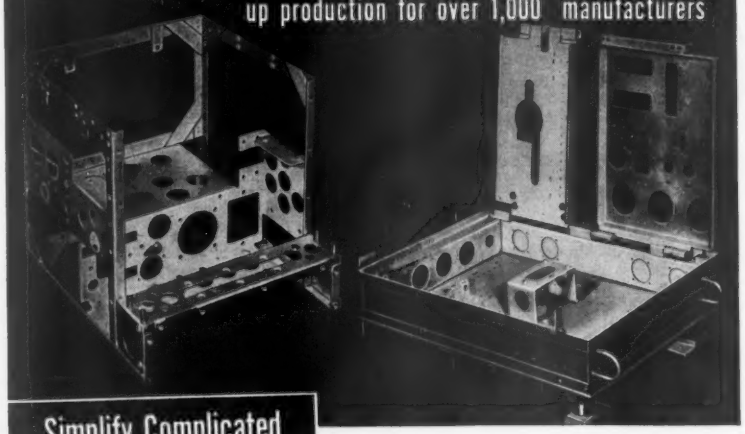
M. E. Dorman

William John Brigham

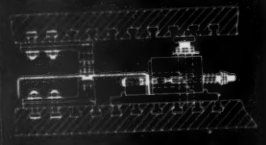
Thomas A. Johnson

William H. Harris, Jr.

Whistler Adjustable and Magnetic Perforating Dies are stepping up production for over 1,000 manufacturers



Simplify Complicated Piercing Operations



Use this HU-50 90° Perforating Unit on the same job with other Whistler Dies . . . often saves extra press operations.

USE WHISTLER Adjustable and Magnetic Dies for perforating, notching and slotting sheet metals...fast, accurate and cost cutting. Complicated patterns can be set up quickly. Hole arrangements can be changed in the press...without waiting and at no extra die cost. New HU-50 units, that pierce at 90° angle, can be used in conjunction with standard perforating equipment. Fewer press operations are necessary.

Re-use the same dies in different arrangements on many jobs. Punches and dies are interchangeable.

Whistler Adjustable Dies can be used in practically every type press. Standard sizes and shapes of punches and dies available up to 3 inches. Special sizes and shapes to order.

S. B. WHISTLER & SONS, Inc.

748 Military Road
Buffalo 23, New York

For prices and application data on this modern way to speed production and cut unit costs, write for these illustrated Whistler catalogs.

For your convenience **Whistler direct factory representatives are located in most principal cities. Their on-the-job application experience, combined with Whistler's 35 years experience in the manufacture of tools and dies, is available on request.**

CIRCLE INFORM-A-GRAM KEY NO. 126

The Motch & Merryweather Machinery Co. announces the recent appointment of **A. J. Snyder** as sales manager of the firm's cutting tool sales division. Snyder formerly was vice president and general manager of the Morse Twist Drill Company of New Bedford, Mass.

◆

M. E. Dorman is the new manager of materials for the Canton division of the E. W. Bliss Company. In addition to supervising the Canton purchasing department, Dorman will be in charge of inventories, stores and receiving operations.

◆

The Timken Roller Bearing Company of Canton announces the appointment of **William John Brigham** to the post of district manager of the Steel and Tube Division's Cincinnati office. Brigham started with Timken in 1940 as a metallurgist.

◆

Thomas A. Johnson, a division field engineer in northern Ohio since 1952, has been appointed supervisor of sales for the abrasives divisions of the Elgin National Watch Company of Elgin, Ill. He will supervise the abrasive division's field-selling force.

◆

At a recent stockholders' meeting, **William H. Harris, Jr.,** was elected to the Board of Directors of the Micromatic Hone Corp. Harris is a graduate of the Michigan College of Mining and Technology. He has worked in the experimental division of the Chevrolet Motor Car Co., and joined Micromatic Hone in 1935 where he rose from assistant chief engineer to vice president in charge of engineering.

. . . . . MEN YOU SHOULD KNOW

C. E. "Ray" Raymond

Charles R. Youmans

Donald MacKay

William Bader

David Reid, Jr.

C. E. "Ray" Raymond has been appointed district manager in the western Tennessee, Arkansas, northern Louisiana and Mississippi area for Lempco Products, Inc., of Bedford, Ohio.

Charles R. Youmans has joined the sales staff of The Cyril Bath Company of Solon, Ohio. He comes to Cyril Bath with a back ground of sales and executive experience covering plant engineering, tooling, cost estimating and equipment specification.

The Grobet File Company of America, located in New York City, has opened a branch office in Hazel Park, Mich. with **Donald MacKay** as manager. MacKay has built up a fine following in the Michigan area during the past years and has had considerable experience in representing industrial distributors.

The Wesson Company of Ferndale, Mich. and the Wesson Metal Corp., Lexington, Ky., manufacturers of carbide cutting tools, announces the creation of an experimental research and product development division. The company has appointed **William Bader** as vice president to head the new division.

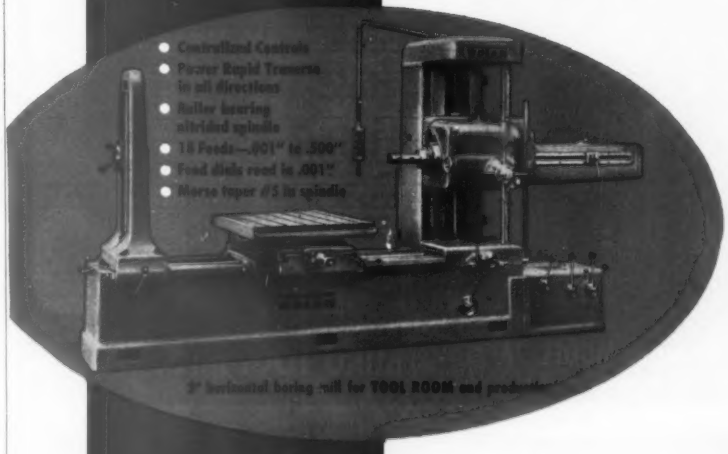
The new manager of the Norton Company's Abrasive and Bond plants in Worcester, Mass. is **David Reid, Jr.**, a veteran of 18 years with the firm. Reid helped develop the process now used in Norton's new abrasive plant which revolutionized the manufacture of grinding wheels. He also is responsible for a company held patent on a diamond abrasive wheel issued in 1949.

immediate delivery.

3" horizontal boring mill for TOOL ROOM and production

table top swivels full 360°

18 speeds—17 to 910 r.p.m.



WOTAN

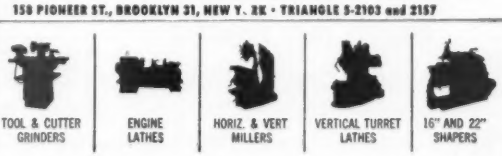
over 75 years of "know-how" in the manufacture of precision production machinery

Users of the WOTAN Boring Mill find that advanced engineering and expert craftsmanship have combined to produce an outstanding piece of tool room equipment that is also well suited to long and short production runs.

Simplicity of design permits an unusually low price. Parker Machine Company has these mills on hand for immediate delivery. Write or phone John Schleiffer at our Brooklyn headquarters for full information.

Parker Machine Company, Inc.

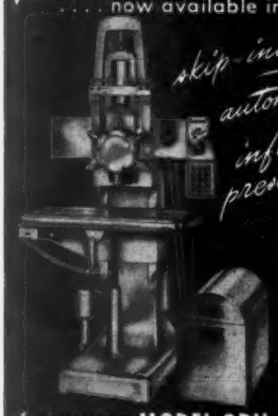
158 PIONEER ST., BROOKLYN 31, NEW Y. 2K • TRIANGLE 5-2103 and 2157



TOOL & CUTTER GRINDERS | ENGINE LATHES | HORIZ. & VERT MILLERS | VERTICAL TURRET LATHES | 16" AND 22" SHAPERS

CIRCLE INFORM-A-GRAM KEY NO. 127

INCREASE PRODUCTION • CUT COSTS • IMPROVE QUALITY
....with
Burgmaster
TURRET DRILLS
.... now available in 3 models
skip-indexing
automatic cycling
infinitely variable
preselective feeds



6 SPINDLE MODEL 2BH
AUTOMATIC • HYDRAULIC

8 SPINDLE MODEL 3BH
AUTOMATIC • HYDRAULIC

SPECIFICATIONS

	MODEL 2BH	MODEL 3BH	MODEL 2A
Drill capacity, mild steel	1¼"	¾"	¾"
Ram travel	12"	8"	8"
Spindle speeds, preselective	12	12	12
Speed range	115-1700	225-3000	225-3000
Depth control	Preselective	Preselective	Preselective
Throat depth	19½"	12"	12"
Table work surface	25"x 35"	17"x 34"	17"x 34"
Table travel	19"	19"	19"
Max. cl'rance, spindle to table	32"	23"	23"
Max. diameter tool clearance	9"	4½"	4½"
Motor, 2-speed, 1800/900	10/5 H.P.	2/1 H.P.	2/1 H.P.
Weight, approximate	7000 lbs.	2500 lbs.	1800 lbs.
Height	120"	78"	72"
Floor space, approximate	6'6"x 5'4"	60"x 51"	38"x 51"

6 SPINDLE MODEL 2A
MANUAL

WRITE TODAY FOR DETAILED INFORMATION
BURG TOOL MFG. CO. Dept. TP-2

HERE'S Tool-flex
NEOPRENE MOUNTED FLOATING TOOL HOLDERS
Another Outstanding Product of
BURG TOOL MANUFACTURING CO.

SELF-CENTERING
(ELIMINATES COSTLY SET-UP)
FULL-FLOATING • POSITIVE DRIVE
OIL-RESISTANT NEOPRENE MOUNTING
REDUCES TOOL BREAKAGE
SIMPLE CONSTRUCTION
(ONLY FOUR MAIN PARTS)

Write for information... Dealer inquiries invited
BURG TOOL MANUFACTURING CO. Dept. TP-2
3743 DURANGO AVE. • LOS ANGELES 34, CALIF.

CIRCLE INFORM-A-GRAM KEY NO. 128

. . . Boring Jig, from page 124

the top section hinged to facilitate loading. Clamping facilities are provided by a recessed plate attached to the top hinged section of the jig into which a threaded rod engages. A star wheel run down on the threaded end of the rod performs the clamping action.

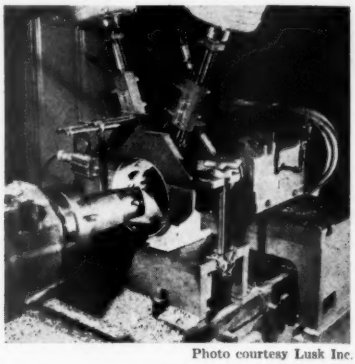


Photo courtesy Lusk Inc.

A new, simple jig developed for boring and facing electric motor frames shown in operation at Electra Motors, Inc. Jig first moves to left for boring I.D. of frame and facing of end. Table then reverses for facing of opposite end, thus greatly speeding production by unskilled operators.

The jig is attached to a traversing carriage powered to move back and forth from left to right. Tooling for this job consists of a boring bar mounted in a power unit at the left side of the machine. A boring bit is set up near the front end of the bar and a facing tool near the rear of the bar. A facing tool is mounted in the power unit at the right side of the machine.

In the machining operation on these pressure molded aluminum frames, the operator loads and clamps the frame in the jig and starts the machine. The frame moves to the left by action of the traveling carriage and as the revolving boring bar enters the frame the boring operation is performed. As this operation is completed the facing tool comes in contact with the face of the frame and is machined.

Upon completion of these two operations the table is automatically reversed and the frame is carried to the right to meet the facing tool mounted in the right hand power unit. As the table continues to move the frame into the facing tool, the facing operation is completed.

Turret lathe machining is eliminated. Pneumatic drills on the jig's top bore name-plate holes.

Close-up showing the cutters and the four-station automatic indexing fixture of the U. S. Duplex Multi-Miller. Cycles of table feed and indexing are entirely automatic.

For Profitable Production of Small and Medium Sized Parts

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Equipment Used — The set-up illustrated consists of a U. S. Duplex Multi-Miller with two opposed spindles arranged with a four-station automatic indexing fixture to mill two slots spaced 180° apart on two pieces simultaneously.

Procedure—The operation of the machine is automatic except for the loading and unloading of the pieces by the operator. Once started, the machine does not stop. The loading and unloading of the four-station automatic indexing fixture takes place during the machine cycle. The cycles of table feed and indexing are entirely automatic.

Production—Two completed pieces (with two slots in each) are produced at each cycle of the machine, which takes ten seconds. Since two pieces are produced per cycle, the gross production is 720 pieces per hour, or a total of 1,440 slots.

If your operations include milling on small and medium sized pieces, U. S. Multi-Millers may be the answer to some of your production problems. Ask for a copy of Bulletin 25-P, which contains complete specifications.

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NMBTA Research Project Aimed at Eliminating "Snarling Chip"

A research project, undertaken by a number of machine tool companies under the auspices of the National Machine Tool Builders Association, may result in the elimination of the long spiral "snarling chip" which gets tangled up and forms a mass hard to handle and clean out of machines.

The machine tool companies have just published a report on "Chip Breakers" according to James C. Hebert, general sales manager of the Jones & Lamson Machine Co. and chairman of the Committee in Charge of the research program.

The publication, consisting of a study of three-dimensional chip flow, is the result of a research project conducted during the last two years at the Sibley School of Mechanical Engineering of Cornell University, by Professor Erik K. Henriksen of the Department of Materials Processing. The study was under the general supervision of Director Harry J. Loberg of the College of Engineering.

The findings given in the booklet are primarily applicable to turning operations. However, they can apply equally well to engine lathes, automatic lathes, turrent lathes, boring mills, automatic bar machines, and will be helpful on other cutting operations.

It has long been known that grinding the top of the tool so as to bend the chip back on itself tends to break the chip so it comes off the machine in small pieces, which can readily be removed without stopping the machine. If, on the other hand, the chip is broken too small, tool life is sharply reduced.

This research project actually is the first attempt to determine for cuts in various grades of steel, what dimensions control the form of the chip, to suggest the best angles of rake and clearance, and to give the tool room a simple rule which will ensure optimum results both as to form of chip and tool life.

In addition to the report, the Steering Committee, directly responsible for the research work, has prepared a wall chart that can be hung in the tool room in order to give the men who grind carbide tools, simple and clear directions on the optimum shape of the tool and the dimensions of the chip-breaker.

The manual and chart will be immediately available only from the members of the NMTBA who participated in defraying the cost of the research project. Among this group are the following TOOLING and PRODUCTION advertisers: Jones & Lamson Machine Co., George Gorton Machine Co. and Pratt & Whitney, Division of Niles-Bement-Pond Co.

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PRESCRIPTIONS FOR PRODUCTION

"Orange peel", for many years a source of trouble to metal-stamping shops, is caused primarily by the large grain size nature of the work material. The more the metal is stretched, the more pronounced is the effect of large grain size. Grain size can now be controlled quite well through cold rolling and annealing. Scovill Manufacturing Company supplies wrought aluminum strip alloys in several annealed tempers to suit deep-drawing surface quality requirements.

Filling the gap between the high-strength and the high conductivity groups of beryllium-copper alloys, a new alloy—Beryldur—has been announced. This alloy combines high strength and hardness values with extraordinary toughness and good electrical conductivity. Where severe forming is necessary, a heat-treatable temper permits precise control of physicals through simple heat treatment.

Multiple spot welding of work that can be fixtured on an 18" x 24" platen, can be efficiently performed on a new standard resistance welding machine. Dual work platens, that load in extended position, are hydraulically moved into vertical position and lifted up to work position. Platen is locked in welding position by two shot pins that contact limit switches and actuate the automatic welding sequences. After welding, the platen retracts and swings out to the unloading position. Superstructure is custom-built, using standard components, to present the proper number of welding guns in a pattern suitable to the specific job. Very close gun spacing is permitted.

Plating racks, baskets, and other equipment can be efficiently protected against chemical attack by application of tough Unichrome Coating 218X. This heavy duty plastisol used as a top coat over a primer provides ideal properties for insulation and protection. The dense, resilient coat absorbs bumps and abuse without chipping, protects workpieces, and offers no source of solution contamination.

One of the secrets in the phenomenal performance of the Electro Arc metal disintegrator, used for machining hardened alloy steels and cemented carbides is the patented gravity-balanced feed of the operating head. Contact with the workpiece is maintained at all times, assuring greater accuracy without side burning. Rate of downfeed is governed by resistance of the metal to disintegration, without any loss of time or power accruing from "bouncing" head.

A universal plating room problem is the proper disposal of rinse water containing acids and salts. A packaged ion-exchange system is available that efficiently removes impurities from rinse waters and returns distilled water to the rinse bath. It will also remove aluminum from an anodizing bath, returning chromic acid to the mother solution.

Paste alloys that combine flux with silver braze alloy, can greatly simplify the brazing of carbide tips to steel shanks. A uniform strong braze can be easily attained without necessity for special operator skill. Faster brazing prevents excessive thermal effects. Elimination of pre-cut shims or alloy strips speeds up entire tool fabricating operation.

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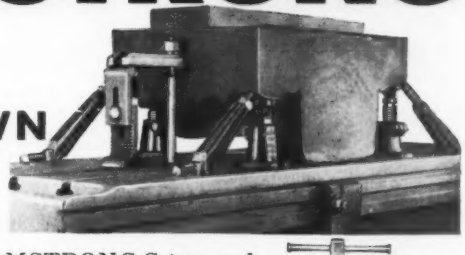

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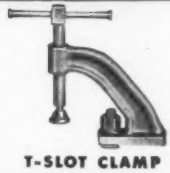

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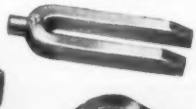

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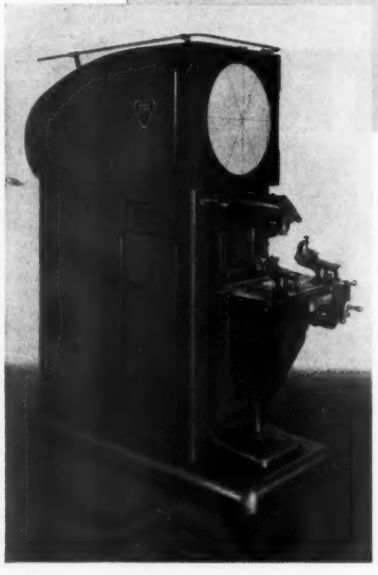

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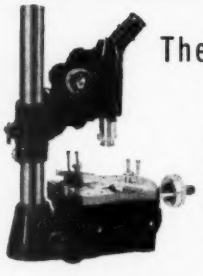

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Quality Control INSTRUMENTS

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. . . Drilling from page 104

on the quill front. Slow speed quills and lead screw tappers can be attached or removed in a few minutes.

Magna Drill has a capacity of one inch in cast iron, ¾" in steel. Stroke is full 5". Throat is adjustable from 6½" minimum

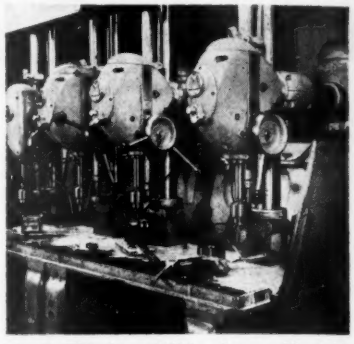

Fig. 5. This four drill head assembly, with packaged power feed, is mounted on a ganged table set-up.

to 14" maximum so that it drills to the center of a 28" circle. Each head has its own 1 hp motor. Clearance is 32" under spindle tip at maximum height. Narrow head design permits drilling on 6½" centers, but by opposing spindles there are no exposed moving parts except the chuck itself. A cam actuated motor mount gives seven instantly available spindle speeds; maximum range is from 380 to 3800 with 1725 r.p.m. motor, 760 to 6860 with 3600 r.p.m. motor. Feed levers are reversible for right or left hand operation. Depth stop is an improved micro-adjustment type with positive lock.

Maintenance is minimized by lifetime lubricated, sealed oversize ball bearings throughout.

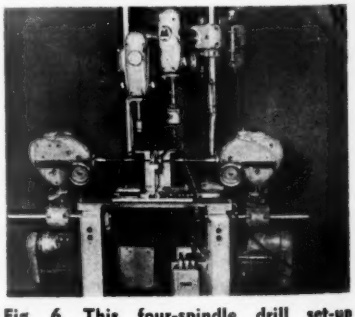

Fig. 6. This four-spindle drill set-up drills and taps seven completely different parts with a half-day change-over time between parts. (The friction tapper shown has now been re-placed with a lead screw tapper). Two heads are mounted on vertical columns and two on horizontal columns attached to the bottom of the table.

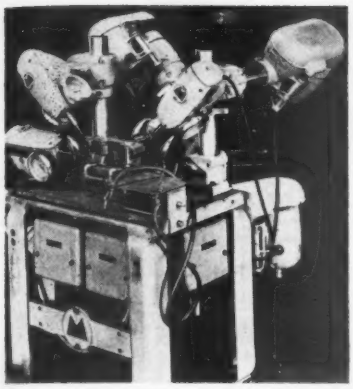

Fig. 7. A five-spindle Magna Drill with five lead screw tappers, is used to tap five holes simultaneously in grey iron castings. Two heads are mounted on vertical columns, while three are mounted on horizontally positioned columns located under the table.

Adjustments are effected through 360° protractors on movable joints with vernier scales for quick precision setup. Yet, when locked in position. Magna Drill's tested deflection is substantially less than conventional industrial drill presses of the same throat and height. Columns are 3½" ground steel tubing, ⅜" wall. Tables are cast iron, surface ground top and bottom;

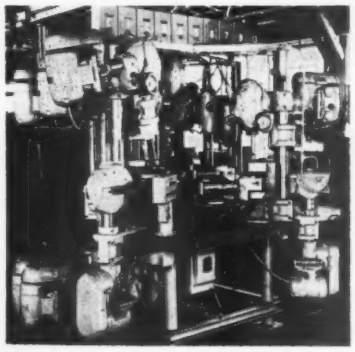

Fig. 8. Using a 6-station rotary indexing table, 16 machining operations are performed with this 13-spindle Magna Drill. Attention is called to the heads at the left which are drilling up through the workpieces.

drilled and tapped top and bottom for mounting heads in a variety of positions; ends are finished, and have dowel holes for ganging in multiples or attaching coolant troughs.

Power feed is self-contained and can be attached to any Magna Drill head in a few minutes. Equipped with solenoid engagement for multiple drilling, it can also be set for continuous cycling and for manual over-feed to power engagement at any depth.

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A6	A19	A32	A45	B13	B26	B39	B52	B65	B78	B91	B104	C7	E8
A7	A20	A33	B1	B14	B27	B40	B53	B66	B79	B92	B105	C8	E9
A8	A21	A34	B2	B15	B28	B41	B54	B67	B80	B93	B106	C9	E10
A9	A22	A35	B3	B16	B29	B42	B55	B68	B81	B94	B107	D1	TSI
A10	A23	A36	B4	B17	B30	B43	B56	B69	B82	B95	B108	D2	
A11	A24	A37	B5	B18	B31	B44	B57	B70	B83	B96	B109	D3	
A12	A25	A38	B6	B19	B32	B45	B58	B71	B84	B97	B110	E1	
A13	A26	A39	B7	B20	B33	B46	B59	B72	B85	B98	C1	E2	

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PERMIT No. 7879
Sec. 34.9 P.L.&R.
CLEVELAND, O.

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CLEVELAND 18, OHIO

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28 pages of KNOW-HOW on the blanking, punching, perforating and bending, forming, deep drawing, and spinning of the stainless steels.

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Now, for the first time, we are offering both of these splendid books in a combination package for only $2.25. Don't miss out on this opportunity to own the stainless steel story.

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1975D Lee Road, Cleveland 18, O.

Gentlemen: Please send me at once:

_____Cold Forming of the Stainless Steels .....$1.00* each

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...the shapers of things to come —

ALLEGHENY LUDLUM HIGH SPEED STEEL TOOL BITS

In a complete range of tungsten, moly, cobalt, and high vanadium types

PANTHER 5
SUPER PANTHER
PANTHER SPECIAL
ML, LXX, SUPER DBL
DBL-3 AND DBL-2

Cut to length . . . bevelled both ends . . . heat-treated to perfection. Just shape the point and you're all ready to go . . . A-L Tool Bits are the last word in convenience.

Made in a complete range of tungsten and moly high speed steels . . . including the new cobalt and high vanadium types that offer superior red hardness, wear-resisting and cutting properties.

Furnished in Standard finish or the popular Ground finish which is extremely accurate in dimension and free from decarburization and scale.

For real Johnny-on-the-spot service on the finest tool bits obtainable, call your local A-L office or distributor . . . TODAY! • *Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa.*

For complete **MODERN** Tooling, call

Allegheny Ludlum

W&D 4683

AL FINE TOOL STEELS SINCE 1854

CIRCLE INFORM-A-GRAM KEY No. 137

INDUSTRIAL NEWS

Goshen Rubber Builds New Silicone Plant

Construction of a new plant for the fabrication of precision silicone parts is under way adjacent to the main plant of Goshen Rubber Co., Inc., at Goshen, Indiana. Facilities and departments in the new plant include presses, mills, extruders, curing ovens and trimming. Completion is expected early in 1954.

—— • ——

"Ernie" Fargo Returns to Cleveland Industrial Tool Co.

"Ernie" Fargo was appointed General Sales Manager for the Cleveland Industrial Tool Co., Inc., Cleveland 17, Ohio, manufacturers of "CITCO" hydraulic diamond turners and dressing tools. He was one of the original founders of the Company during World War II and later retired to manage other business interests. His return will institute a stepped-up Sales Program.

—— • ——

New Manager of Manufacturing at Westinghouse Cleveland Plant

C. A. Fike has been appointed manager of manufacturing at the Cleveland, Ohio plant of Westinghouse Electric Corporation's Lighting Division.

Mr. Fike assumes his new post after service as superintendent of manufacturing at the Cleveland plant.

A native of Mattawana, Pa., he joined Westinghouse in 1912 as an apprentice at the Company's East Pittsburgh Works. After holding several supervisory positions, he was named superintendent of plant transportation at East Pittsburgh in 1926.

Mr. Fike subsequently transferred to Cleveland in 1935 as factory superintendent, from which position he comes to his present assignment.

During World War I, he was with the U.S.A. Signal Corps.

—— • ——

Johnson & Bassett, Inc., Worcester, Mass., manufacturer of Indexing Trunnions, announces that their representatives The Donald B. Hunting Company, 7446 Vine Street, Cincinnati 16, Ohio, have opened an office in Dayton, Ohio at 1904 Brown Street.

Mr. Lee Weber of Dayton is in charge and is available for sales and service on Johnson & Bassett products in the area.

—— • ——

Sipi Metals Corporation. William O. Bosserman, it is announced by Maury E. Lippert, Vice-President in charge of Sales of Sipi Metals Corporation, 1720 North Elston Avenue, Chicago 22, Illinois, has been named Managing Engineer, Anodes of Sipi Metals Corp.

Mr. Bosserman, for the past 25 years, has been associated with the non-ferrous field. His experience embraces all phases of plating related to Anode use, particularly in the Copper and Zinc base fields.

Mr. Bosserman, in assuming charge of the Anodes Division, will be active in field sales and engineering throughout the company's entire sales area.

Sipi Metals Corporation have been producers of all non-ferrous alloys for many years for the plating as well as the foundry and allied trades.

TO GEAR MANUFACTURERS Exclusively

if you have trouble meeting production schedules.

if you have trouble meeting precision tolerance specifications.

YOU should "read-up" on the HAMILTON line of Small-Gear, Precision Hobbing Machines!

3

THREE PRECISION MACHINES to meet your every requirement.

HAMILTON No. 00

For the generation of spur gears and pinions only.

Capacity: 2" O.D. of workpiece.

HAMILTON No. 1

Hobs spur and spiral gears, worm gears and worms (to three thread), splined shafts, gear sectors, and pinions.

Capacity: 6" O.D. of workpiece.

HAMILTON No. 1-B

Generates any shape that can be made on the No. 00 or the No. 1 machines, *plus* bevel gears and face gears.

Capacity: 6" O.D. of workpiece (3" O.D. by 3/16" face, for bevel gears.)

Exclusive Greater range of hob spindle speeds: 109 to 1259 R.P.M. – 12 speeds.

Exclusive Speed, feed, indexing. *Each can be selected independently.* This, and wide range of hob speeds, adds flexibility; reduces set-up time; gives quick selection of speed and feed to suit material and gear size.

Exclusive Alignment and trueness of work and hob spindles are held to within .0002".

Exclusive Generates gears from 3 teeth to 1200 teeth.

Exclusive Accumulative error of not more than .0002"

THE COMPLETE STORY will be sent to you free for the asking. Request BULLETIN GH-5310 DO IT NOW!

THE Hamilton TOOL COMPANY

832 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

INDUSTRIAL NEWS

Motch and Merryweather represents White-Roth Machine Corp.

George Roth, president of White-Roth Machine Corp., Lorain, Ohio, announces the appointment of Motch and Merryweather Machinery Co., Cleveland as regional distributor for White-Roth's BurrMaster, a new tumbling machine.

Sales in Eastern Michigan, Ohio, Western Pennsylvania, Kentucky and West Virginia will be handled by forty sales engineers of Motch and Merryweather's New Machinery Distributor Division.

Motch and Merryweather Machinery Co. has four conveniently located offices to give prompt sales and service attention. Sales inquiries from the above territory on the BurrMaster tumbling machine should be addressed to Motch and Merryweather Machinery Co. at 715 Penton Bldg., Cleveland, Ohio; 2842 West Grand Blvd., Detroit, Mich.; First National Bank Bldg., Cincinnati, Ohio; and Clark Bldg., Liberty and Wood Sts., Pittsburgh, Pa.

—•—

New Engineers at Lempco

Lempco Products, Inc., Bedford, Ohio announces that V. R. Roy, Chief Engineer, has been joined by H. B. Van Auken as his assistant. Mr. Roy's extensive experience in the field of automotive service equipment design will be supplemented by that of Mr. Van Auken who is a graduate of Case Institute of Technology and has spent a total of nine years at Cleveland Twist Drill and National Acme Co. before joining Lempco. He is a specialist in screw machine attachment and hydraulic mechanism design —has plans for the refinement of design features in the Lempco line of Automotive and Industrial Machine Tools.

Lemco also announces the appointment of Frank Vasarhely as Chief Tool Engineer.

Prior to his joining Lempco in 1950, Mr. Vasarhely spent over thirty years in tool die and machine design with Warner & Swasey Co., Paramount Tool Co., Columbia Axle and The Miller and Taylor Co., all of Cleveland.

He is well-known for tool and hydraulic machine design.

Columbus McKinnon Chain Promotes Seven

Don S. Brisbin, Vice President, Sales, of the Columbus McKinnon Chain Corporation and its Chisholm-Moore Hoist Division, Tonawanda, New York, today announced the promotion of seven staff members and the appointment of another to enhance the company's ability to serve its cutomers and to expand sales operations to keep pace with the continued growth of the company. Promoted to Manager of Field Sales with headquarters at the home office in Tonawanda is F. T. Benjamin, formerly Chicago District Manager. Appointed to fill Mr. Benjamin's post is Karl L. Miller, formerly Assistant General Sales Manager of the Buffalo Bolt Company, North Tonwanda, who will be Regional Sales Manager in the Chicago area. Promoted to the positions of Product Manager with headquarters in the Tonawanda office are E. J. Byrne, Hoists, G. R. Grace, Industrial Chain and R. E. Gerspacher, Automotive Chain. To the positions of Customer Service Manager, R. L. Pfanner, Hoists, O. H. Hager, Industrial Chain, and F. G. Schweitzer, Automotive Chain.

THE HAMILTON

PORTELVATOR®

(Portable Elevating Table)

MAKES IT *Easy* TO LIFT • LOWER LEVEL • TRANSPORT LOADS UP TO 5,000 lbs.

3 TABLE SURFACES

Can be worked at from ALL 4 SIDES

Slow or fast lift.

Self locking at any height.

4 POINT SUPPORT (table can't tip)

Lift mechanism can be operated from either end.

Turns easily on anti-friction casters. Positive floor lock.

WELDED CONSTRUCTION

Mechanical lift through worm, worm gear and screw.

TABLE CAN'T SETTLE

STYLE "A" (Illustrated)*

Max. Height 40" Min. Height 25" Length 33" Width 21" Weight 225 lbs.

Capacity 2,000 lbs. (plus safety factor)

FURNISHED ON ORDER

SAF-T-RAIL — Guard rail fits either top or middle table.

ROLLER CONVEYOR TOP • RUBBER TIRED WHEELS

*THREE STANDARD MODELS TO CHOOSE FROM

GET THE DETAILS WRITE FOR BULLETIN P-5247

THE Hamilton TOOL COMPANY

832 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

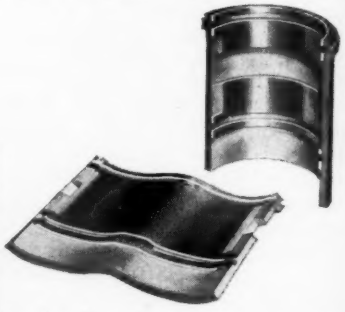
CIRCLE INFORM-A-GRAM KEY No. 139

BABBITT FUSED TO BEARING BACKING CREATES CHEMICAL BOND

The illustration below shows one-half of a babbitt lined, steel backed, split bearing flattened out under pressure. As can be noticed, the bond between babbitt and backing remains unbroken. This permanent fusion, a characteristic of Waukesha Centri-Fuse Bearings, was developed from the most advanced practices in centrifugal casting combined with a special process used in preparing the backing. The result is an actual chemical bond between babbitt and backing, which eliminates the need for mechanical means of anchoring the babbitt, such as slots, undercuts, dowels or rabbets.

Split bearings, sleeve bearings and oil seals produced by the Centri-fuse method are made to exact specifications for diesel and gasoline engines, electric motors and generators, compressors, pumps, turbines, jet engines and special machinery of all kinds.

Centri-Fuse Bearings can be supplied in any quantity desired, from a single bearing to a long



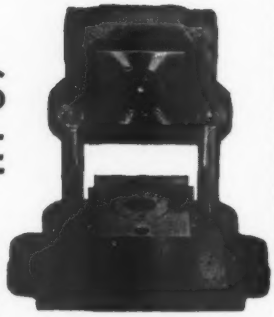
production run, on an economical basis. For literature and technical data, write Waukesha Bearings Division, Waukesha Tool Co., 1426 Arcadian Avenue, Waukesha, Wis.—or

Circle Inform-A-Gram Key No. D1.

"A MUST wherever WASHERS are made!"

HOVIS

OFFERS YOU THIS SIMPLE, UP-TO-THE MINUTE METHOD

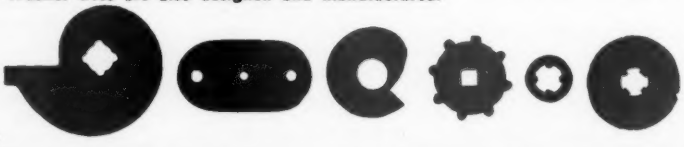


There's no need to make a complete new Die for any type washer or blank. The HOVIS UNIVERSAL WASHER DIES provide a Master Holder and by merely changing 5 SMALL, EASILY REMOVABLE PARTS the new washer or blank is produced . . . Special sets of parts are available for use in Master Washer Units enabling customers to produce irregularly shaped pieces and shallow draws. Multi-Washer Dies are also designed and manufactured.

Made in 5 sizes:

¾"—1½"—2½"—4"—6"

Write for literature.



HOVIS SCREWLOCK COMPANY

8100 E. NINE MILE ROAD VAN DYKE, MICHIGAN

Phone: Slocum 7-4800 Suburb of Detroit

CIRCLE INFORM-A-GRAM KEY No. 140

PLASTIC TRAYS HELP SOLVE SPACE RIDDLE

Trays designed for storage of precision machined parts, produced on an assembly line basis have been made for a manufacturer faced with the daily accum-

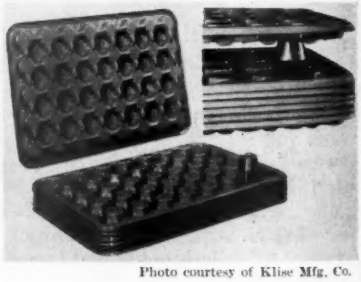


Photo courtesy of Klise Mfg. Co.

ulation of several thousand parts, awaiting inspection.

Engineered so that recesses on both the tops and the bottoms of the trays exactly align with the machined parts, six to eight trays may be safely stacked on each other.

The plastic trays resulted in a 50% saving in both weight and cost. Formed of a styrene copolymer, the trays are strong, durable, clean, acid-resistant, non-corroding and non-abrasive.

PREDICT "BIG" 1954 FOR CEMENTED CARBIDES

Cemented carbides are in for a big year in 1954. The rapid development of automated machines and the obsolete state of machines in thousands of small to medium-size metal-working manufacturing plants across the country are the two important clues, according to a recent statement made by Kenneth R. Beardslee, general manager of Carboloy Department of General Electric Company.

He pointed out that many large companies have been quite impressed with the performance and capabilities of automated production lines such as those used by Ford in Cleveland and Buick in Flint, Michigan. To obtain top performance in such completely automated lines, good, tough cutting tools are needed. They are needed to withstand the terrific cutting pressure encountered, and to reduce to a minimum the downtime caused by tool servicing.

Cemented carbides, Beardslee emphasized, are meeting these problems with a marked degree of success. In fact, it was the carbide cutting tool that encouraged the idea of multi-operations through its unusual properties

With the development of better carbides — entirely possible, as was discovered with the creation of an entirely new family of carbides this year—it will be possible for many small companies to take a look at some of the newer machines being developed for multi-operation by the machine tool builders. Many of these small to medium-size organizations have just about reached the end of their rope so far as their present machines are concerned. They have been operating with machine tools ranging from 20 to 25 years old—machines that were obsolete prior to World War II. "As I see it", Beardslee said, "this year, with the pressure of defense production easing, will present a golden opportunity for these companies to re-equip their plants. For a majority of them, it is a must since a return to a competitive situation will mean that these companies either produce or get out of business.

"In my estimation, I don't believe these companies will get out of business—they have too much at stake. I believe they will choose to take advantage of some of the new machines now being offered. They also will choose new general-purpose machines, perhaps not as highly complicated as their automated brothers but fully capable of taking advantage of the production advantages offered by carbide cutting tools."

Beardslee pointed out that if a small manufacturer invests in a new machine capable of operating with maximum speeds and feeds, and built to a high degree of precision, he can easily lower production costs with carbide cutting tools.

Don't invite controversy!

Have your gage blocks inspected periodically

$16.50 for an 84-block set.

Smaller sets proportionately lower

. . . all makes of blocks inspected.

Don't allow wear in gage blocks to cause unexplained difficulties in assembly. When trouble develops start checking the blocks immediately.

If they have been used daily for any long period of time they should be examined just to make sure their accuracy is still within tolerated limits. Better yet send them to us before trouble occurs. You may find that only a few blocks need replacement.

Instead of discarding an entire set, replace those that need replacement and save money in doing so. The set will be returned within 24 hours after it is received with a certificate of inspection, noting the degree of wear of each block. Webber Gage Company, 12912 Triskett Rd., Cleveland 11, Ohio.

INSPECTION SERVICE INCLUDES:

1. Comparison with master blocks certified by the U. S. Bureau of Standards.
2. Removal of burrs and nicks which impair accuracy.
3. Notation of degree of wear of each block.
4. Identification of those blocks that are worn or damaged beyond repair with recommendation for replacement.

WEBBER GAGE COMPANY
12903 Triskett Rd., Cleveland 11, OHIO

Webber

MICRO-ACCURATE GAGE BLOCKS & FIXTURES

LARGEST EXCLUSIVE MANUFACTURERS OF GAGE BLOCKS

CIRCLE INFORM-A-GRAM KEY No. 141

HARDINGE
ELMIRA, N.Y.

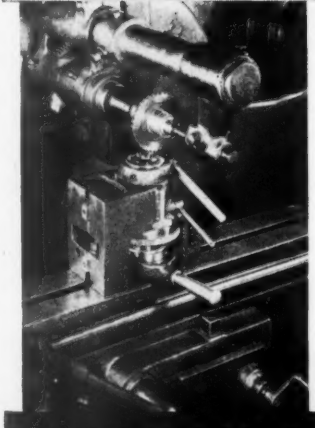
COLLETS for LATHES and MILLING MACHINES

Precision work requires precision collets. HARDINGE collets assure you of all-essential accuracy plus durability, because they are hardened and ground both internally and externally, and have heat-treated threads.

HARDINGE-SJOGREN SPEED Collet Chucks

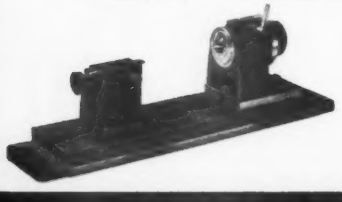
Increase machine capacity 25% to 40% with the fast action of a handwheel-operated HARDINGE-SJOGREN Speed Collet Chuck. Let your operators get the full use of your tool room lathes, engine lathes and grinders.

Five sizes: 1", 1 3/8", 1 3/4", 2 1/4", and 3 1/2" Collet Capacity; Threaded, Tapered Key-Drive, Cam-Lock, and American Standard Spindles.

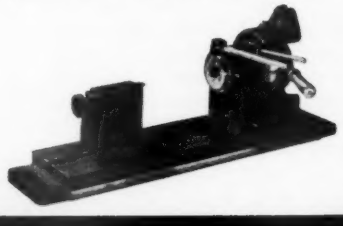


HARDINGE COLLET INDEX FIXTURES

The way to increased production is to hold work accurately and provide for rapid indexing. HARDINGE Collet Index Fixtures—H-4 for Tool Room and Inspection Departments; HV-4 for Production Departments—will help increase production on either new or old machines. Planned interchangeability for a variety of applications. Buy these standard fixtures instead of making expensive special fixtures



H-4



HV-4

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

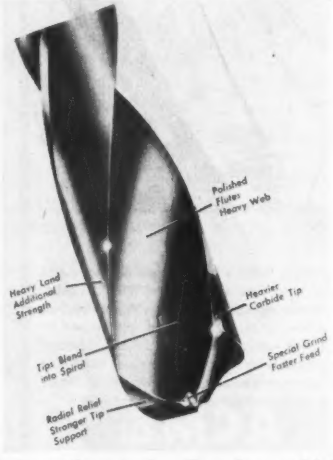
"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

CIRCLE INFORM-A-GRAM KEY No. 142

PROGRESS ON PARADE

NEW DEVELOPMENTS • IMPROVEMENTS • COST AND TIME SAVERS — Mail FREE Inform-A-Gram Card for MORE Details.

New Carbide Drill. Five construction features on this new carbide tipped twist drill are pointed out in the illustration. Extensive tests have indicated this tool is an extremely

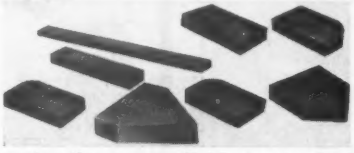

Polished Flutes Heavy Web
Heavy Land Additional Strength
Heavier Carbide Tip
Tips Blend into Spiral
Special Grind Faster Feed
Radial Relief Stronger Tip Support

fast cutting tool. Speeds as high as 8" per minute in cast iron have been obtained. More data can be obtained from the Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Circle Inform-A-Gram No. A1.

Hydro Springs. Two new series of high capacity Wales Hydra Springs, using compressible liquids, are now being produced by the Hydra Spring Division of Wales-Strippit Corp., North Tonawanda, N. Y. They are

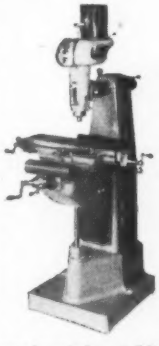
said to eliminate many age-old spring problems by providing respectively up to 6000# and 8500# force in a relatively small space. For further information write for the Wales Hydra Spring Catalog.
Circle Inform-A-Gram No. A2.

Designed for Reamers, Tool Bits, Milling Cutters and other tools is the new line of Wendt-Sonis carbide blanks and inserts. Styles 1000, 2000, 3000, 4000, 5000, 6000, RRT, STB, reamer blanks, solid rounds and

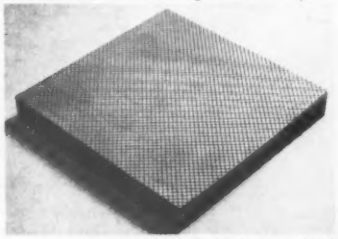


center tips are available in standard carbide grades. Inserts are solid carbide or half carbide and half steel in round, triangular, square or diamond shapes. For further information write to Wendt-Sonis Co., Hannibal, Mo., or— **Circle No. A3.**

Vertical Miller. Designed to reduce operator fatigue, with all controls within easy reach, the Duff Vertical milling machine is featured by having extreme versatility in the rotation of the milling head. Calibrated in degrees, the head can be rotated 360° around the overarm, and 45° forward or back, with the overarm set in a key-way to permit forward and backward adjustment without affecting accuracy or operation. The miller weighs approximately 1,200 lbs. and requires only 1 sq. yd. of floor space. For further information write to the Duff Machine Co., 31 Wingate St., Haverhill, Mass., or—
Circle Inform-A-Gram No. A4.



Semi-Steel Lapping Plates are now available from the Glover Mfg. Co., 736 Mohican Place, Meadville, Pa. Features of these plates are: the elimination of hard spots that cause

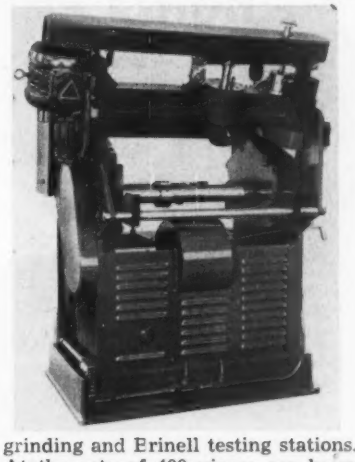


uneven wear; lapped flat to within 0.0001"; 1/32" x 45° chamfer; ⅛" squares with 0.020" slots; radiused corners and surface ground sides and bottom. Literature available.
Circle Inform-A-Gram No. A5.

"Extended Width" slotting cutters have been added to the standard milling cutter line introduced by Millit, Inc., 55 Flint St., Rochester 8, N. Y. A new stagger tooth method of mounting replaceable blades allow the manufacturer to make any width cutter desired. Extended

width cutters now available range from 4 to 14 inches in diameter and can be made to cut any width over ½". Replaceable blades are available with HSS, cast alloy or carbide tips. Further information furnished upon request.
Circle Inform-A-Gram No. A6.

A New Semi-Automatic Brinell Testing Machine has been announced by the Detroit Testing Machine Co., 9390 Grinnell Ave., Detroit 13, Mich. This unit automatically indexes test pieces through both spot



grinding and Erinell testing stations. At the rate of 400 pieces per hour, crankshafts, gun barrels or other shaft-like parts, are fed into the machine and slide out—ready for inspection. Further information available upon request.
Circle Inform-A-Gram No. A7.

PRECISION-FINISH YOUR OUTSIDE DIAMETERS

The Odee-HONE

★ ACCURATE
★ INEXPENSIVE
★ VERSATILE
★ LIGHTWEIGHT

Corrects out-of-roundness, waviness, chatter . . . Generates diametric size within .0001" tolerance . . . Hones all parts from ½" to 2½" in diameter—regardless of length or material . . .

Can be used on any lathe, drill press, electric drill . . .

Simple to set up and operate—no aligning, fixturing or wheel dressing is necessary . . .

Removes a few "tenths" or a few "thousandths" stock in less time than it takes to re-center, indicate a part, and dress an abrasive wheel.

Write to:

MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT • DETROIT 38, MICHIGAN

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CIRCLE INFORM-A-GRAM KEY No. 144A

When you need precision steel

DOWEL PINS

FAST

Get SAME-DAY SHIPMENT from

Order from Acme's huge stock of standard nominal and oversize Dowel Pins . . . shipment made within 24 hours. Whether you need a few, or many thousand, packaged or bulk, Acme can supply them FAST! Special sizes ground from semi-finished stock to fill any dowel pin requirement. Send for details now!

ACME INDUSTRIAL COMPANY

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MFRS. OF STANDARDIZED DRILL JIG AND FIXTURE BUSHINGS

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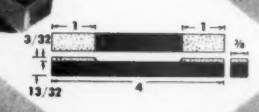
USE DIAMOND HONES FOR

- Retouching dulled carbide tools in the set-up
- Breaking edge of carbide tools after grinding
- Smoothing rough-ground finishes
- Chamfering carbide parts



• double end 200-600 grit • free cutting resinoid bond • live areas, each 3/8 x 1 x 3/32 • overall 3/8 x 13/32 x 4 • diamond all the way through

$16.50 Ea. Not From Stock

Use Dry or With Kerosene or Cutting Oil

TOOLS • WHEELS
POWDER • COMPOUNDS

Write For Catalog of All Diamond Products

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DIAMOND TOOL RESEARCH CO., Inc.

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CIRCLE INFORM-A-GRAM KEY No. 144E

REVOLUTIONARY! NEW!

KRASBERG UNIVERSAL AUTOMATIC STOP . . . can be used on any die!

INSTALLED IN MINUTES!

SIMPLY MOUNT TO FRONT OF STRIPPER WITH TWO SCREWS — THEN DRILL HOLE FOR ARM AT GAGING POSITION.

FOR FULL INFORMATION WRITE TO:

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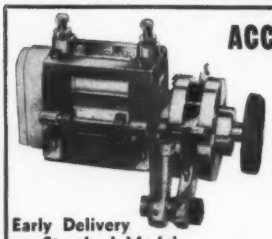
2501 W. HOMER ST. — CHICAGO 47, ILLINOIS

CIRCLE INFORM-A-GRAM KEY No. 144D



ACCURACY with SIMPLICITY and LOW COST with "RFC" ROLL FEEDS

Models to fit:
ANY PRESS
FOR ANY JOB
FOR STOCK UP TO 12" WIDE

Early Delivery on Standard Models

"RFC" ROLL FEEDS are quality built for long, dependable service.

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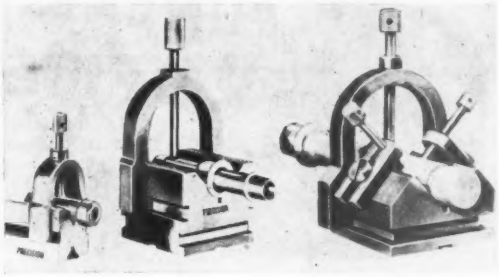
ROLL-FEEDS CORPORATION

Pawtucket, Rhode Island

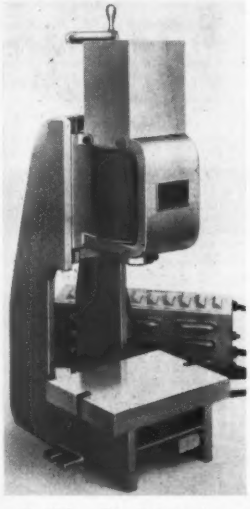
An Electrix Affiliate

CIRCLE INFORM-A-GRAM KEY No. 144E

These Uni-V-Blocks are built for greater accuracy. They are made of forged Chrome Moly and special low temperature treatment give them the same stability found in master gage blocks. Model 1250 (left) will nest up to 1" dia. with matched pairs square and parallel and concentric to each other within 0.0002. Matched

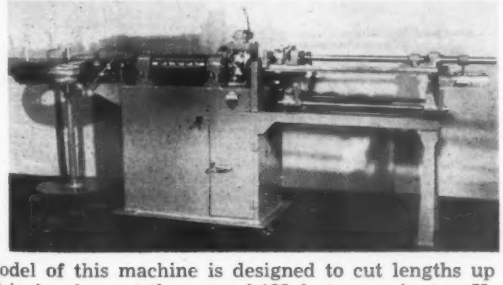


pairs of Model 5000 (center) also are quaranteed square and parallel and concentric to each other to an extreme degree of accuracy. Model 3000 (right) has the same features as Models 5000 and 1250 in matched pairs. For further information write to Precision Tool & Mfg. Co. of Illinois, 1305 Laramie Ave., Cicero 50, Ill. or—
Circle Inform-A-Gram No. A8.



Impact Hammer. A heavy-duty electric impact hammer is now being produced by Black & Webster, Inc. This bench model unit is capable of delivering impacts, adjustable from a few pounds to 10,000 lbs., at rates up to 75 blows a minute. It is particularly suitable for heavy-duty staking, crimping, punching, forming, riveting, stamping, marking, etc. It is economical to operate, drawing 25 amps current, only, during the duration of the power stroke—0.025 of a second. Write to Black & Webster, Dept. N90, 445 Watertown St., Newton 58, Mass., for further data or—
Inform-A-Gram No. A9

A Wire-Straightening and Cutting Machine for 1/16 to ¼" wire and powered with a 5 hp. 1800 rpm motor has been developed by the G. C. Patterson Machine Co., 3409 Trumbull St., Cleveland 15, Ohio. The standard



model of this machine is designed to cut lengths up to 40 inches long at the rate of 125 feet per minute. However, the machine can be built with an extension to cut lengths up to 12 feet or longer. Also, much greater feed can be attained because a 3-roll straightener is furnished, which does a great portion of work which the flyer or straightening arbor would normally be called upon to do in machines not so equipped. For further information, write direct to the manufacturer or—
Circle Inform-A-Gram No. A10.

The RPM's stay up while grinding . . . not only when the grinder runs idle.

It is an established fact that surface speeds must stay up to approximately a mile a minute if you want to grind—not just rub. Every mechanic knows this, but inexperienced buyer may order tools that maintain proper grinding speeds only when running idle. The speed of Kipp air grinders drops but slightly when put to work. That means better work—longer wheel life.

Buy Kipp air tools for best results, lower prices.

MADISON-KIPP CORP.
212 Waubesa St., Madison, Wis., U.S.A.

CIRCLE INFORM-A-GRAM KEY No. 145

POLISH · GRIND · BURR · SHARPEN

IN SECONDS...WITHOUT TEARING DOWN SET-UPS

Do It Faster With A DREMEL MOTO-TOOL

Dremel Moto-Tools are used in many different types of industries by thousands of diemakers, machinists and hobby craftsmen for polishing and grinding dies, burring parts, sharpening cutters, etc. A money-maker and time-saver, the Moto-Tool does close work in seconds without tearing down costly production set-ups.

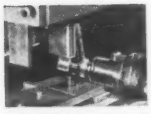
APPROXIMATELY 27,000 R.P.M.

MOTO-TOOL NO. 2, with one emery wheel point $17.85

MOTO-TOOL KIT NO. 2, with 23 accessories (high speed steel cutters) and Model 2 Moto-Tool in sturdy steel case $25.93

GRINDING

SHARPENING



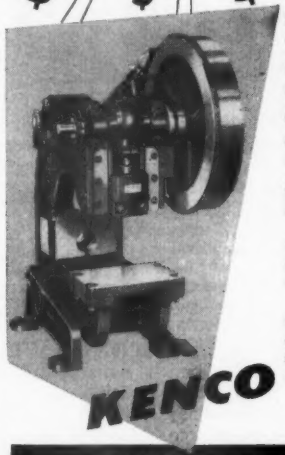
BURRING

See Your Nearby Industrial Distributor or write for catalog.

DREMEL MFG. CO., Dept. 524-B, RACINE, WIS.

CIRCLE INFORM-A-GRAM KEY NO. 146A

$ $ $ $ THE PRESS THAT PUNCHES OUT PROFITS $ $ $



KENCO 4 and 5 TON PUNCH PRESSES are built with precision and ruggedness found only in large presses. *They actually outperform and out-produce presses costing four times as much.* Kenco is "the only small press without the headaches."

And the Kenco 4-in-1 easily converts into a standard die space press, long die space, half and horn press...Four presses in one.

Let us prove you'll punch out big profits with Kencos... There are over 250 Kenco dealers to serve you. Write for details and name of nearest supplier.

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5211 Anaheim-Telegraph Rd., Los Angeles 22, Calif.

CIRCLE INFORM-A-GRAM KEY NO. 146B

Largest Vernier *Readability*

FOSTER Vernier Calipers

- Eye-Strain Eliminated
- Greater Accuracy
- Faultless Workmanship
- Longer Slides

FOSTER Vernier Calipers range from 6" to 96". All have the .1225 large Vernier.

Available from stock.

Immediate Delivery.

FOSTER Inspection Height Gages to 48"—the Finest.

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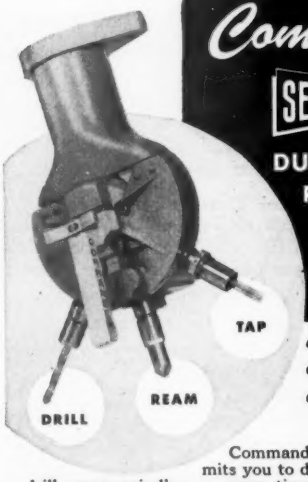
FOSTER SUPPLIES CO.
6122 MILWAUKEE AVENUE • CHICAGO 30, ILLINOIS

CIRCLE INFORM-A-GRAM KEY No. 146C

Commander SELECT A SPINDLE

DUAL SPEED DRILL PRESS TURRET

DRILLS, REAMS, TAPS ON 1 DRILL PRESS SPINDLE!



- **Fits Any Drill Press**
- **Increases Production**
- **Reduces machine, fixture costs**

Commander Select-A-Spindle permits you to do 3 operations on a single drill press spindle ... save time ... eliminate multiple handling of piece parts, speed production and reduce overall costs. Dual Speed Select-A-Spindle permits selection of proper speed for each operation. Quick, positive hand indexing positions each tool accurately for sequence operations. Select-A-Spindle is built to tap with any 1, 2 or all 3 spindles to the full capacity of the unit. Adjustable torque control spindles for protection of taps to ¼" available.

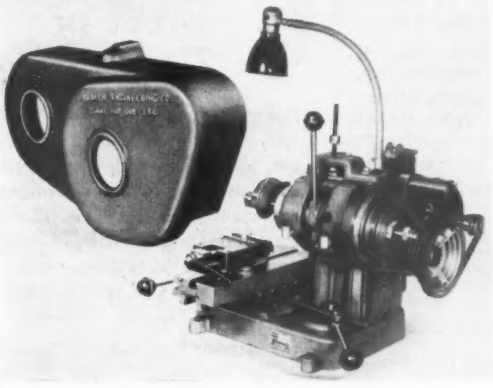
Write for illustrated circular on Select-A-Spindle, other Commander Production Tools and name of your nearby Commander Distributor

Commander MFG. CO.
4228 W. KINZIE STREET, CHICAGO
PRODUCT OF COMMANDER . . . BUILDER OF PRODUCTION TOOLS

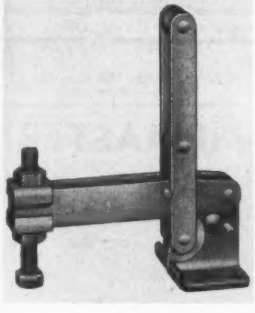
CIRCLE INFORM-A-GRAM KEY No. 146D

This New Dual Air Valve, made by Danly Machine Specialties, Inc., 2100 S. Laramie Ave., Chicago 50, Ill., is designed to eliminate one of the hazards of mechanical press operation—accidental stroking due to valve failure. It has been successfully tested for millions of cycles. Further information is available upon request.
Inform-A-Gram No. A11.

Special Accessories. A new line of special accessories for the Barker bench mill, which makes possible a greater range of milling and machining operations, is now available. A special low-spindle speed drive has been developed for slitting and stradle milling. In addition to the standard speeds of 1000, 1725 and 3000, nine

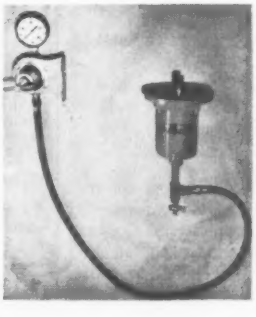


new speeds are offered ranging from 214 to 768 rpm. Also included are a vise, cutter guard, and low speed pulley assembly (right side of photo). Shown at left is the low-speed pulley belt guard. Complete new literature describing the Barker Mill, its accessories and operational capabilities is available from the Barker Engineering Co., 500 Green Rd., Cleveland 21, Ohio.
Circle Inform-A-Gram No. A12.



Midget Sized Clamps are now offered in two new types by the Lapeer Mfg. Co., Lapeer, Mich. Model V-100 with vertical handle and horizontal mounting surface, has a clamping force of 100 lbs., with spindle located at the end of toggle bar. Templates of either model in full, half or quarter sizes are available upon request. Write direct to Lapeer Mfg. Co.
Inform-A-Gram No. A13.

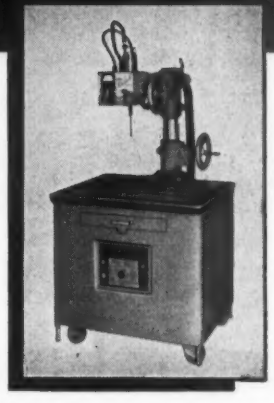
Pneumatic Die Cushion. The Dayton Rogers Mfg. Co., Minneapolis 7, Minn., announces a new Model CR self-contained pneumatic die cushion of all steel construction and provided with a hardened and ground pin pressure pad, custom made to specific die and punch press requirements. The die cushion is supplied with a reducing regulating valve and pressure gage.
Inform-A-Gram No. A14.



METAL DISINTEGRATION

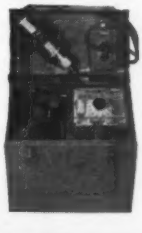
and what it can do for you

Remove broken taps fast without distortion
Cut any shape hole in cemented carbides
Cut dovetails in hardened dies
Cut oil holes in hardened gears without annealing



Literally hundreds of thousands of dollars are saved annually by corporations that are using Metalmasters in just tool and die repair alone.

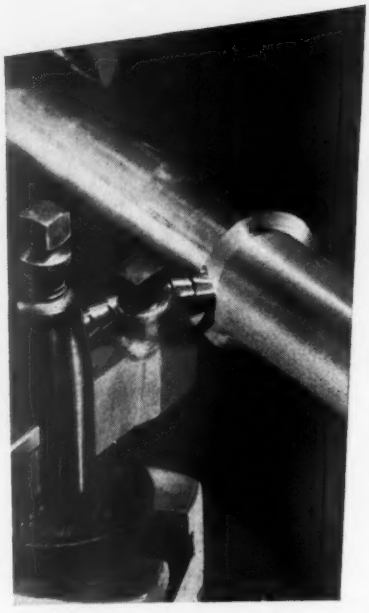
There's a technical engineer in your area to give you an on-the-spot demonstration in your own plant at your convenience. (NOTE: It is not uncommon to pay for a Metalmaster with just one short demonstration through savings on workpieces.



There's a Metalmaster designed for your operation and priced to fit your needs. For information as to the many uses and benefits Metalmaster can offer you, write today on your company letterhead to:

Metalmaster
DIVISION OF CLINTON MACHINE COMPANY
CLINTON, MICHIGAN

CIRCLE INFORM-A-GRAM KEY No. 147



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for BETTER VALUE

Turning to South Bend for precision lathes has been the turning point for better values for manufacturers.

These dependable lathes are specifically designed and built for the efficient machining of metals. Their accuracy will save time and material on precision work, especially when tolerances are exceedingly close. Remember, too, that in these versatile lathes you get quality materials and workmanship assuring long, dependable service. They represent maximum lathe value per dollar of cost.

Write for catalog describing 9", 10", 13", 14½", 16" and 16-24" swing lathes. Also ½" and 1" collet turret lathes.

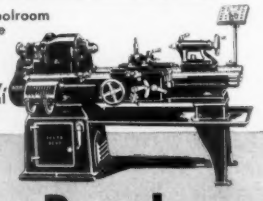
Building Better Tools Since 1906

SOUTH BEND LATHE WORKS
SOUTH BEND 22, INDIANA

Time terms: 10% down, balance 12 or 18 months.

16" x 6' Toolroom Lathe

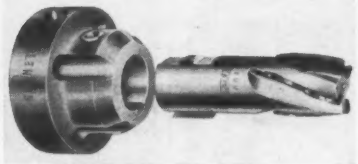
$2690
f.o.b. factory, less electrical equipment



South Bend Lathes

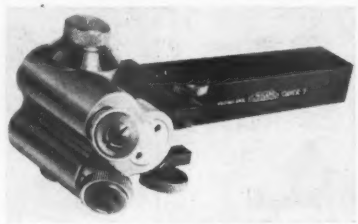
CIRCLE INFORM-A-GRAM KEY No. 148A

Carbide End Mills. Development of a new line of helical carbide end mills that give 3 to 10 times more production and finishes of 20 r.m.s. and better, has been announced by Sonnet Tool and Mfg. Co., Haw-



thorne, Calif. In actual tests on 4130 heat-treated steel, (130,000 p.s.i.) these new "Helicarb" cutters removed 23.6 cu. in. of metal per minute on a 20 hp milling machine. Additional information, sizes and prices are available.
Circle Inform-A-Gram No. A15.

Knurling. A new knurl cutter, designed to economically produce cross, diamond and straight knurls of various pitches, on machinable metals, cast iron, non-ferrous metals and plastic is the latest Alina precision



tool. It also can knurl delicate thin-walled parts without internal support, produces clean knurls without burrs, maintains fine diametral limits, and knurls diameters from 1/16" to 10 feet. More data available from Alina Corp., 401 Broadway, New York 13, N. Y.
Circle Inform-A-Gram No. A16.

Toolmakers Flat Finds Many Uses. A new small size black granite surface plate for bench use is now on the market. Its size is 8" x 12" x 2" and it only weighs 15 lbs. It is finished to an accuracy of 0.0002" over-

all and should find plenty of use in small plants for tool and die makers, benchment, machinists, model shops, etc. Collins Microflat Co., 2326 E. 8th St., Los Angeles 21, Calif., will send literature to those requesting it.
Circle Inform-A-Gram No. A17.

Beauty **TO LOOK AT**
...BEAUTY IN *Performance*

Hollow-ground and bright all over, Reltool End Mills are not only the best looking end mills you ever saw . . . they're proven in performance and cutting efficiency. In addition, they're designed for *easy chip flow* and 10% to 35% longer cutting life. Next time you need End Mills, re-tool with Reltool!

The RELTOOL Line Includes: Combined Drill and Countersinks • Cut-off Blades • Die Sinking Cutters • Dovetail Cutters • End Mills • End Mill Holders • Hollow Mills • Key Seat Cutters • Lathe Centers • Lathe Mandrels • Machine Countersinks • Metal Slitting Saws • Milling Cutters — all types • Screw Slotters • Tool Bits • Specials.

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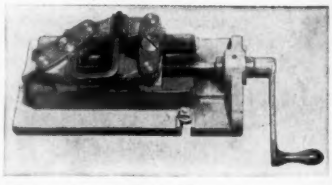
Reltool CORPORATION
RELIABLE METAL CUTTING TOOLS
4540 W. BURNHAM ST. • MILWAUKEE 46, WIS.

CIRCLE INFORM-A-GRAM KEY No. 148B

CLAMPMASTER



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Eliminates fixtures for the holding of odd-shaped work pieces. Quick adjustment for positive holding of round, elliptical, tapered, triangular, or irregular shapes. Two moving jaws for quick centering of work. Available in four sizes for bench or machine work of all types.

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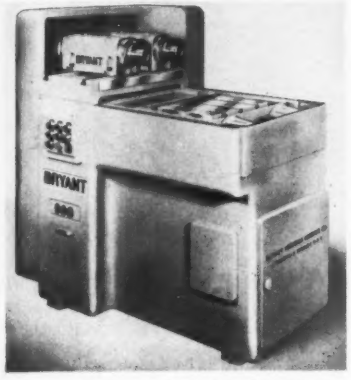
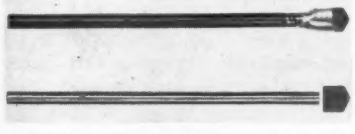
CIRCLE INFORM-A-GRAM KEY No. 148C

Boring Machine. For precision boring, precision drilling, straight or contour turning and boring, facing and grooving especially where fine finish and high production are desired, the Bryant Chucking Grinding

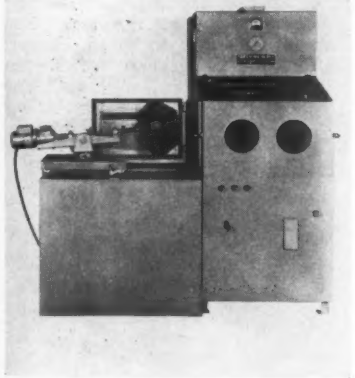


Co., Springfield, Vt., has introduced a new 998 boring machine. It can be tooled either as a single purpose machine for quantity production or for miscellaneous work in small lots. **Circle Inform-A-Gram No. A18.**



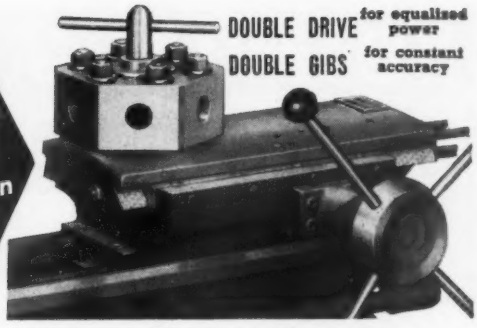
Carbide Tipped Drill. This drill, developed by the Hayden Twist Drill Co., 8626 Lyndon Ave., Detroit 21, Mich., is specifically designed for drilling plastics and shallow holes in cast iron. It is manufactured in sizes from 13/64" to 11/16". Further details available.
Circle Inform-A-Gram No. A19.

Wet Blasting. The addition of a new model to its line of wet blasting equipment has been announced by Cro-Plate Co., Inc., 747 Windsor St., Hartford, Conn. This unit was designed for the bulk, high-production



rate finishing, cleaning or deburring of small parts, such as screw machine products, stampings, small castings and extrusions, precision machined components, etc.
Circle Inform-A-Gram No. A20.

Enco Self-Indexing HEXTURRET For Lower Production Costs and Speedier Output



DOUBLE DRIVE for equalized power
DOUBLE GIBS for constant accuracy

√ Custom built to fit all lathes from 9" to 18".
√ Smooth, sensitive control with Pilot wheel drive through twin gears and racks.
√ All bearing surfaces hand scraped.
√ All parts of indexing mechanism hardened, assuring accuracy.

Manufacturers of the most complete line of HEXTURRET BED TURRETS, TURRET TOOL POSTS, and TAILSTOCK TURRETS in the country.

Close tolerance shoulder-screw job held to plus .002; minus .000.

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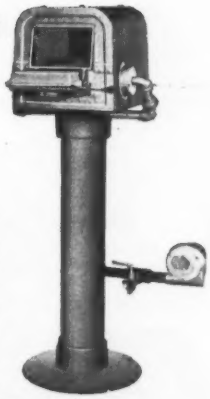
CIRCLE INFORM-A-GRAM KEY No. 149A

SPEED PRODUCTION

ELIMINATE DELAYS with Quick Acting JOHNSON Furnaces

Heat treat high speed steels
Harden high carbon steels
Braze carbide tipped tools

JOHNSON No. 120 Hi-Speed



Heat treat tools, dies and small metal parts in your own plant. Quick Acting JOHNSON No. 120 Hi-speed delivers 1500° F. in 5 minutes, reaches 2300° F. in 30 minutes. Gets the job done fast to save time and gas. Temperatures easily regulated with accuracy. Firebox 5 x 7¾ x 13½. Complete with Carbofrax Hearth, G. E. Motor and Johnson Blower.

No. 120 Pedestal Style—$155.50 F. O. B. Factory

There is a Quick Acting JOHNSON Unit for every toolroom and shop. Write for complete catalog. Johnson Gas Appliance Company, 575 E Avenue, N.W., Cedar Rapids, Iowa.

JOHNSON Since 1901
FURNACES FOR INDUSTRY

CIRCLE INFORM-A-GRAM KEY No. 149B

KUTMORE ADJUSTABLE HOLLOW MILLS

DESIGNED FOR ALL YOUR HOLLOW MILL WORK

- ANY COMBINATION OF . . . TURNING . . . TAPERING . . . FACING . . . CHAMFERING . . . TREPANNING IN **ONE PASS.**
- EXCLUSIVE **MICROMETER** ADJUSTMENT FEATURE FOR RAPID SET-UP.
- CUTTING CAPACITIES FROM 1/32" TO 2" DIAMETER IN STANDARD STOCK.

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OUR ENGINEERING DEPARTMENT IS AT YOUR DISPOSAL ON YOUR HOLLOW MILL PROBLEMS

CARL WIRTH & SON, INC. 1625 CLINTON AVE. NO. ROCHESTER 5, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 150A

Improved Screw Thread Production

The O-Vee Gauge, with the use of a standard hand micrometer will measure accurately the pitch diameter of a screw and indicate whether it is within standard limits. No calculations, tables or reference books required. Approved and used by leading Government Departments. Write for illustrated leaflets.

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STOP DUSTS INSTANTLY

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DUSTKOP

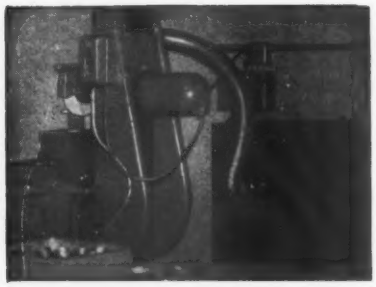
Available from stock of 22 standard models.

300 cfm to 10,000 cfm

Ask for Catalog 605-2. Describe dust problem for recommendation by return mail—No Obligations.

AGET-DETROIT CO.

213 Main St., Ann Arbor, Michigan



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Specify DESTACO **Arbor Spacers and Shims**

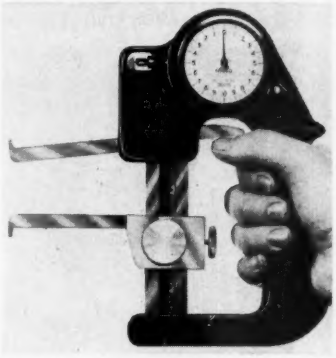
For milling, slitting and gang-saw setups, shimming gears and bearings. Sets in 20 diameters ⅜" to 4" . . . 19 graduated thicknesses .001" to .125", specials over .125". Spacers with keyways, shims without. Stocked by Industrial Distributors.

DESTACO **DETROIT STAMPING COMPANY**

344 MIDLAND AVENUE • DETROIT 3, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 150D

Diametrick Gage. A new inside diameter, dial indicator measuring instrument is now available for the improved checking of "0" ring and

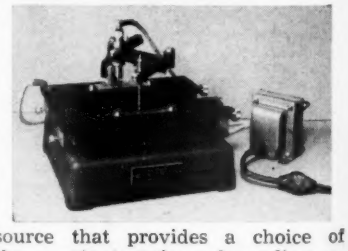


snap ring grooves. This instrument is also applicable to check inside diameters. It will check holes from 1.375" to 3. 625" in diameter and will expand for grooves as deep as ¼". **Circle Inform-A-Gram No. A21.**

Cutting Carbide Wastes. A radically new designed vertical toolholder features a "built-in" carbide chipbreaker that provides correct chip formation over a wide cutting range from single chipbreaker width and eliminates expensive chip grind-

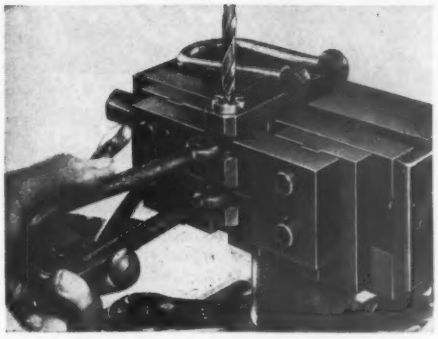
ing of inserts. The toolholder also features a method of holding which permits using all of the carbide insert. Further information on the toolholder and blanks from Catalog VR-435 issued by Vascoloy-Ramet Corp., Waukegan, Ill. **Circle Inform-A-Gram No. A22.**

For Electric Etching Work. A new attachment has been developed that makes it possible to easily convert the new Mico engraver so that electric etching work can be done. The attachment includes its own power



source that provides a choice of three output ratings depending on the hardness of the material being worked on. Further information from the Mico Instrument Co., 88 E. Trowbridge St., Cambridge, Mass. **Circle Inform-A-Gram No. A23.**

The "JOHN'S" DRILL JIG



A Self-Centering Production Tool
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SPECIAL FIXTURES
Made in 6"-8"-14" sizes
For odd shaped parts
TOOL REMOVABLE JAWS ONLY
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HEUSER MANUFACTURING CO.
1638 N. Paulina St., Chicago 22, Ill.

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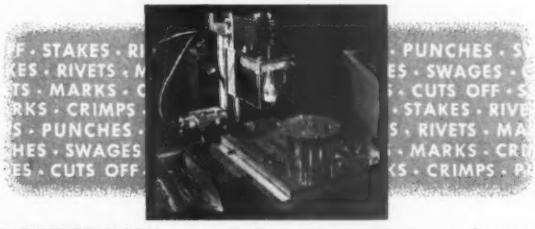
ELECTROPUNCH SAVES TIME
for Telechron Clocks!


F · STAKES · RI
KES · RIVETS · M
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RKS · CRIMPS
S · PUNCHES
HES · SWAGES
ES · CUTS OFF
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ELECTROPUNCH — the all-electric impact hammer, fastens front plates to Telechron clocks 575% faster! Here's how: — the assembly, after being positioned, is simply slipped under the ELECTROPUNCH, tripping a limit switch that automatically cycles the work stroke. Total time: 1.93 seconds — as compared to the 11.10 seconds previously required for fastening with a power-driven screwdriver.

Delivers impacts up to 10,000 lbs. — up to 125 blows per minute! Economical to buy, operate and maintain — adaptable to wide range of applications. Operable from 115 V., A.C. outlets.

Write — or phone Bigelow 4-6370 — for folder showing complete line of Black & Webster electric production tools.

BLACK & WEBSTER, INC.
Dept. 2, 445 Watertown Street, Newton 58, Mass.
Solenoid-operated Production Tools

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Notch 12 PIPE ENDS per MINUTE

Makes PERFECT JOINTS FOR WELDING OR BRAZING!

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Standard ARC-FIT in hand or power press shears contours for "T" joints for ½" to 2" pipe or tubing with easily interchanged dies.

Special ARC-FITS for larger sizes, angles other than 90°, slotting or notching square pipes, angle iron or flat stock.

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VOGEL TOOL & DIE CORPORATION
1817 N. 32nd AVE. • MELROSE PARK, ILLINOIS

Work Shrunk

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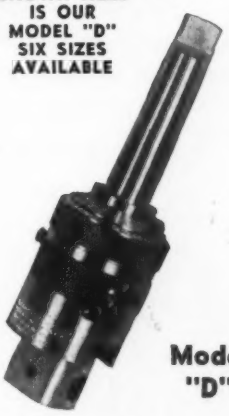
SOONER or LATER

YOU WILL COME TO KNOW THAT "A BORING HEAD THAT WON'T FACE IS NOT COMPLETE"

SHOWN HERE IS OUR MODEL "D" SIX SIZES AVAILABLE

REDESIGNED, MANY NEW FEATURES

ALL HAVE POWER FEED FOR FACING!



Model "D"

Write Today for Complete Details

CHANDLER TOOL COMPANY
MUNCIE, INDIANA

COMBINED BORING & FACING TOOL HEADS
Chandler-Duplex

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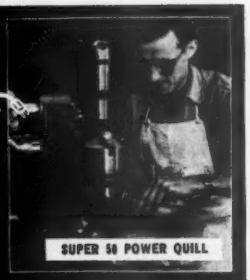
Precise

LOWEST COST PRECISION FOR TOOL ROOM AND PRODUCTION



UP TO 45,000 R.P.M. AND ¼ H.P. ON AC/DC. Only PRECISE has the speed, power and precision needed to turn *Tungsten Carbide Mills* as well as all other rotary tools with shank diameters to ¼". Grind, mill, finish, polish any material from wood to the hardest alloy steel. MODELS SUPER 30 and SUPER 40 are for hand applications or machine set-ups; PRECISE SUPER 50 is for heavy duty in machine set-ups. Precision quills and chucks; lifetime-lubricated, micro-precision bearings; machined metal housings. Mounts and accessories for each model extend versatility on standard machine tools.

New

PRECISE SUPER 30
45,000 R.P.M. and ⅛ H.P. in 35 oz. Draw collet.

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PRECISE PRODUCTS CORP. 1341 Clark St., Racine, Wis.

CIRCLE INFORM-A-GRAM KEY No. 152A

When You Specify "CHICAGO" Threaded Products You Get FASTER SERVICE

Our more complete stocks mean "at once" shipments of quality fasteners when you need them—no production delays—no maintenance "shut downs."

"Chicago" quality threaded products include:

Hexagon Head Cap Screws, Bright and Heat Treated Grade 5 • Square Head and Headless Set Screws • Hexagon Nuts • Hexagon Castellated Nuts • Socket Head Cap Screws • Socket Set Screws • Socket Pipe Plugs.

To Speed deliveries to you, order "Chicago" products from your nearest Industrial Supply Distributor. He carries a complete stock of our products—he will gladly furnish you with samples—his familiarity with your local field conditions enables him to fill your needs promptly and correctly.

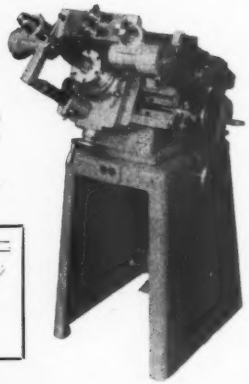
The CHICAGO SCREW COMPANY
2519 WASHINGTON BOULEVARD
BELLWOOD, ILLINOIS

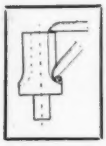
CIRCLE INFORM-A-GRAM KEY No. 152B

Punches Shaped from the SOLID with OTTMANN Punch Shaper

FEATURES:

1. No holder plates required.
2. Simple work mounting.
3. No re-setting — Work can be adjusted to any position of tool.
4. Forms shaped accurate. Parallel and true.





5. Minimum hand work.
6. Convenient, simple operation. Uses standard shaping tools.

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90 WEST ST. NEW YORK 6. N. Y.

CIRCLE INFORM-A-GRAM KEY No. 152C

There's a reason 76%* of all popularly-priced Tool and Cutter Grinders sold in 1952 were "Knock-Outs"

MODEL B860

Will do anything that machines costing 2 or 3 times more will do . . . yes and in less time.

Distributed Only Through Franchise Dealers

K. O. LEE CO.
ABERDEEN S D

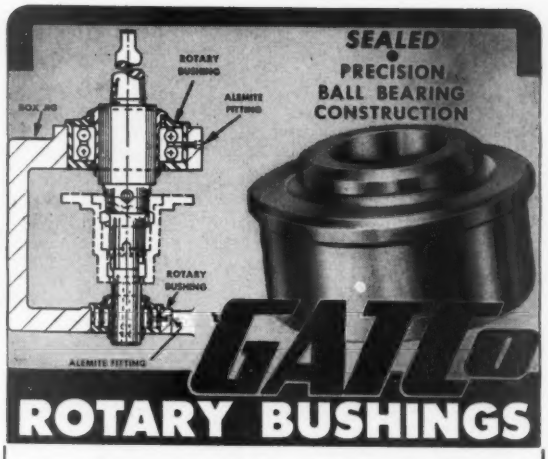
* SALES STATISTICS FURNISHED ON REQUEST

CIRCLE INFORM-A-GRAM KEY No. 152D

Power Presses. A new 13-ton Electromatic Power Press and a 13-ton "Multi-power" Press (illustrated) have been added to the press line available from the Famco Machine Co., Kenosha, Wis. With these new machines Famco now has 16 bench and floor type power press models in a 3 to 18-ton capacity range. The two new presses are constructed of close-grained extra heavy cast semi-steel. They have one-piece heat-treated alloy crankshafts, split bronze-bushed main bearings and a greater ram area. Further details will be furnished by Famco.
Inform-A-Gram No. A24.

Metal Sawing Machine. This 6" x 6" capacity metal sawing machine is a rugged accurate two-speed machine for general purpose use. Actual capacity is 6¾" x 6¾". A broad shouldered "U"-type over-arm is accurately machined. The saw blade is held with great rigidity by special flat steel blade holders. For additional information write to Peerless Machine Co., 1600 Junction Ave., Racine, Wis. **Circle Inform-A-Gram No. A25.**

New Coiled-Stock Coating Machine. This machine, which automatically feeds material from the uncoiler, deburrs the edges, coats both sides with drawing compound, and feeds the presses, was developed by the Union Tool Corp., Warsaw, Ind. The machine is powered by a 1 hp motor complete with magnetic starter and foot control conveniently located for the operator. It is equipped with antifriction, self-aligning ball bearings and constructed of heavy welded steel. The machines can be built to handle stock widths from 0" to 60", thicknesses from 0.005 up. **A26.**



FOR

DRILLING
CORE DRILLING
ROUGH
AND
FINISHED BORING

The inner race of the GATCO bushing rotates with the tool, piloting the tool accurately below or above the work—or both.

Eliminates expensive tool construction—Reduces tool wear—Prevents seizure and pilot breakage—Especially adapted where precision is required.

Write for full information and prices

GATCO ROTARY BUSHING CO.

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Telephone PLYMOUTH 1472

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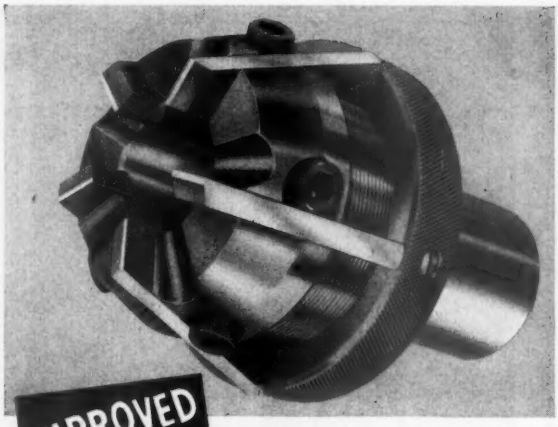

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GENESEE
Adjustable Hollow Mill

There is a size and style Genesee for every hollow milling job. Standard sizes from 0 to 2", standard with straight or Morse Taper shanks carried in stock.

- Quick — easy adjustment
- Simple sharpening method
- High speed steel—cast-alloy —Carbide tipped blades
- Let our Engineering Department solve your Production tool problems

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GENESEE MANUFACTURING COMPANY
566 HOLLENBECK ST. • ROCHESTER 21, N. Y.
Adjustable Hollow Mills • Facing and Counterboring Tools • Special Production Tools

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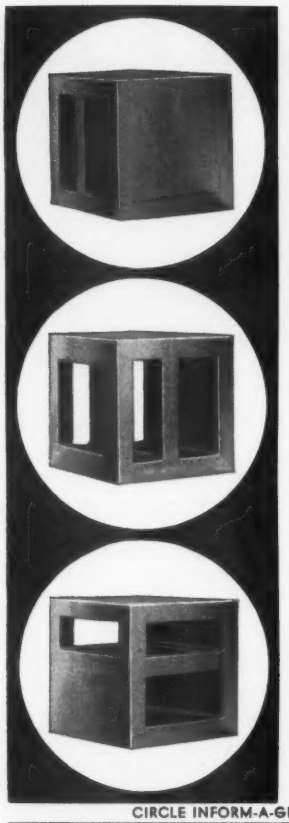


3 IN 1

COMBINATION TOOL

CHALLENGE UNIVERSAL BOX ANGLE

This new versatile tool has the clamping facilities of an *angle iron* . . . the stability, balance and accuracy of a box *parallel* . . . the perpendicular flat surface of an angle plate. Made of high grade special analysis semi-steel, heat treated and precision ground. Furnished in two sizes — 6x6x6 and 8x8x8 inches. Other sizes can be made to order.

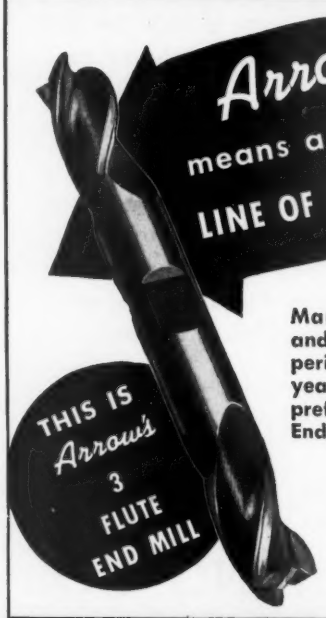
747

Challenge
TRADE-MARK ®

THE CHALLENGE MACHINERY COMPANY
Office, Factories and Show Room: Grand Haven, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 154B

ARROW TOOL & REAMER CO. • Established 1916



Arrow means a complete LINE OF END MILLS

THIS IS *Arrow's* 3 FLUTE END MILL

Manufacturing skill and tool making experience for over 37 years — adds up to preference for Arrow End Mills.

Call your Distributor or write direct for literature

ARROW TOOL & REAMER CO.
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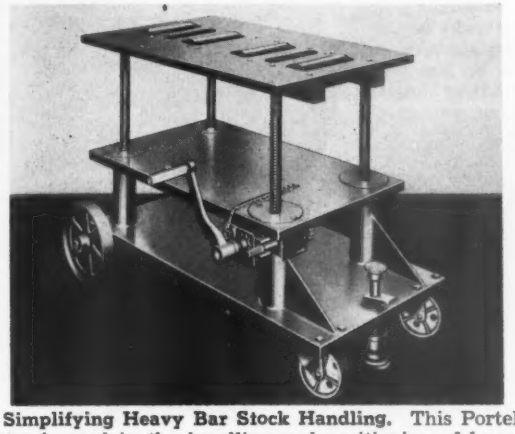
CIRCLE INFORM-A-GRAM KEY No. 154C

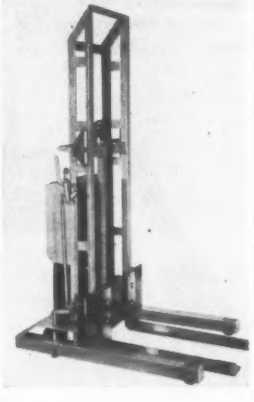
ORDER BUSHINGS
The EASY WAY!
Ask for handy "Flip-a-page" Catalog (B-649) and prices
COLONIAL BUSHINGS, Inc.
31780 Groesbeck Highway • Fraser, Michigan

COLONIAL
DRILL JIG BUSHINGS

CIRCLE INFORM-A-GRAM KEY No. 154D



Simplifying Heavy Bar Stock Handling. This Portelvator is used in the handling and positioning of heavy bar stock. The table has a capacity of 2,000 lbs. and has a vertical travel of 14". Additional details can be obtained by writing to The Hamilton Tool Co., Hamilton, Ohio, for Bulletin No. P-53. **Inform-A-Gram No. A27.**



This Electric Portable Lift-Truck has been added to the increasing line of low-priced materials-handling equipment available from the Safeway Industrial Equipment Corp., 184 N. Franklin St., Chicago 6, Ill. The new model is designed as a "4 in 1" unit; it operates as a fork-lift, straddle-lift, platform-lift and a drum stacker with a capacity of 1,250 lbs. Further information on this lift truck will be sent to those requesting it. **Inform-A-Gram No. A28.**

Metal Cutting Band Saw. This Kalamazoo Model 8C new horizontal metal cutting band saw cuts 8" round stock, 16" flat stock, 8" pipe and a variety of shapes including very thin sections. It will cut with an accuracy of a few thousandths with a minimum of kerf and

leaves no burr. Saw frame descent through sawing operation is correctly maintained by a hydraulic mechanism. Detailed information and specifications are available from the Machine Tool Division, Kalamazoo Tank and Silo Co., 165 Harrison St., Kalamazoo, Mich. **A29.**

fact:

nothing in the world is as hard as a diamond

FACT: *in grinding carbides* — nothing cuts as fast, as cool and as economically as a diamond wheel.

FACT: *in drilling* — diamond bits give lowest cost per foot in hard geological formations.

FACT: *in dressing grinding wheels* only diamond dressers will do the job where fine finish, high production or intricate forms are involved.

FACT: *in wire drawing* — diamond dies assure accurate sizing, bright finish and high output.

FACT: *in lapping* — diamond compounds and powders save countless skilled man-hours by producing wanted sizes and finishes faster.

FACT: *in cutting* — diamond cutting and boring tools are standard for tough jobs where the best of competitive materials fail.

FACT: *in sawing* — diamond saw blades feature speed and economy on quartz, concrete, stone, sapphire, glass and diamond.

FACT: **Diamond Tooling gives you precise production, more production, uninterrupted production, *lowest cost production.***

IT IS A FACT . . . THERE IS NO ECONOMIC SUBSTITUTE FOR DIAMONDS

News Note: there is not a shortage of industrial diamonds. Learn the detailed facts about this wonder material. Write today for specific information and free booklet, "The Diamond That Pays For Itself."

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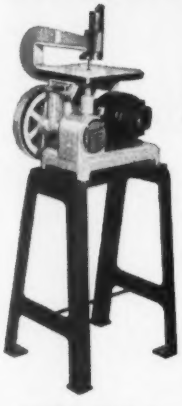
124 East 40th Street, New York 16, N. Y.

CIRCLE INFORM-A-GRAM KEY No. 155

CUT TOOL AND DIE-MAKING COSTS WITH . . .
Milwaukee
DIE FILERS
PROFILE GRINDERS



DIE FILERS
. . . for straight-line sharp corner filing, sawing and lapping

This low cost precision-built unit performs all die making operations at savings up to 40%. Furnished complete with motor and two overarms. No extras to buy.

Write for illustrated Bulletins and Prices

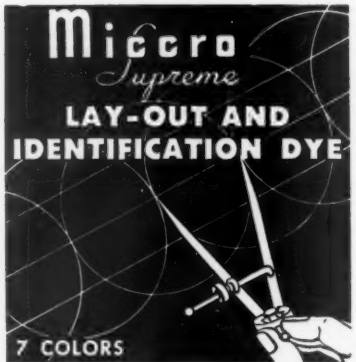
PROFILE GRINDERS
. . . for high speed Precision Grinding of curved and Irregular Contours

Standard features include 20,000 or 30,000 R.P.M., or a combination of these spindle speeds, ½ H.P. motor, Collet Chuck, Compound tilting table, built-in wheel dresser.

RICE PUMP & MACHINE COMPANY
228 Park Avenue Belgium, Wisconsin

CIRCLE INFORM-A-GRAM KEY No. 156A

Miccro Supreme
LAY-OUT AND IDENTIFICATION DYE

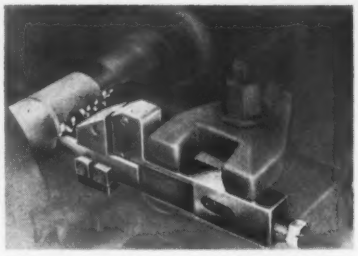


For Tool, Die, Pattern or Template layout on metal . . . Quick identification of bar stock, sheets, strips or parts . . . Shows up in sharp relief—dries instantly . . . Write for sample and circular on company letterhead.

MICHIGAN CHROME & CHEMICAL COMPANY
8615 Grinnell Ave. • Detroit 13, Mich.

CIRCLE INFORM-A-GRAM KEY No. 156B

New Tool Holder. This unit will absorb vibrations and shocks occuring when turning rough surfaces or other than round work. It also will maintain a constant cutting angle,



prevents breakage of bits, prolongs cutting life and permits higher machine tool speeds. The American Tooling Corp., 60 E. 42nd St., New York, N. Y. will gladly supply additional information.
Circle Inform-A-Gram No. A30.

Whiton Precision Spindles for surface grinders permit finishes up to 2½ to 4 micro inches. An improved method of spring preloading keeps the wheel chatter-free under radial and axial loads. The extra rigidity allows the wheel to spark out very fast. The spindle assembly is accurately balanced on its own precision ball bearings. Regardless of wear or temperature changes, the self-adjusting features of the surface grinder spindles permit a much higher degree of finish. For further information write direct to The Whitnon Mfg. Co., 217 High Street, New Britain, Conn., or— **Circle No. A31.**

Strap Clamps. This month Northwestern Tool & Engineering Co., 116 Hollier Ave., Dayton 3, Ohio, will increase its selection of strap clamps to 22 sizes. This selection will accom-

modate over 90% of all clamping operations on punch presses, milling machines, jig-borers and other metal and wood cutting machines. A leaflet giving details is now available.
Circle Inform-A-Gram No. A32.

DOES IT BETTER
DOES IT FASTER

SIMPLEX-M
ABRASIVE BAND GRINDER

The precision of a machine tool plus the durability of a workhorse. Complete with ½ H.P. Heavy Duty Motor and automatic band tension control. Nothing like it for finishing metals, plastics, wood, fibre, etc.

OTHER STYLES AND SIZES IN NEW MANUAL ON FINISHING WRITE TODAY

WALLS SALES CORP.
333 Nassau Avenue, Brooklyn 22, N. Y.

CIRCLE INFORM-A-GRAM KEY No. 156C

X-750 KAM-GRIP
DRILL JIG!

WRITE US TODAY

for complete details on how you can profit by using our low-cost, time-saving KAM-GRIP Drill Jigs. These semi-automatic tools have cut costs and increased production in many plants performing secondary operations on small parts.

The descriptive literature is free and we'll be glad to send it to you.

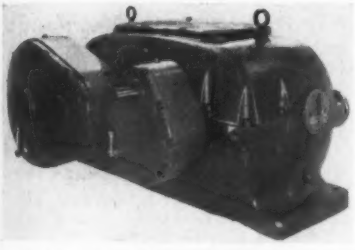
MANUFACTURERS ENGINEERING SERVICE, INC.
SECURITY BLDG. • TOLEDO, OHIO

CIRCLE INFORM-A-GRAM KEY No. 156D

Slitting Saws, featuring heavily reinforced bodies to prevent shearing during stresses and to prevent shattering during high operating speeds are now being produced by The Nelco Tool Co., Manchester, Conn.

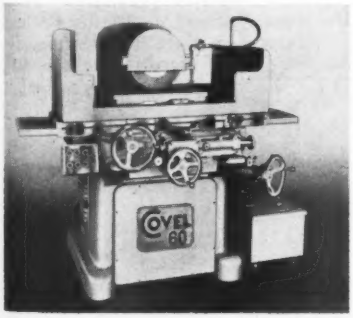
Circle Inform-A-Gram No. A33.

The P.I.V. Variable Speed Drive provides accurate speed control, adjustable over a wide range of speeds.



Folder No. 2374 available from the Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill., has complete details.
Circle Inform-A-Gram No. A34.

Precision Surface Grinder. This machine is designed to turn out tool room and production jobs with more precision, at greater speed, less floor space and lower cost. It features a 14" x 24" work surface, 15" width of cross feed, 27" table travel and vertical work capacity of more than 18". It is ideal for grinding of trim and mould dies, plastic moulding and forming dies, form and cut-off tools, etc. For complete information write for Bulletin No. 619, Covel Mfg. Co., Benton Harbor, Mich., or—



Circle Inform-A-Gram No. A35.

PRECISE
hole location,
easy contour
inspection with
new machine
tool microscope

Any machine shop, large or small, can save time and money on milling and boring work with the new Perkin-Elmer Model 11 Machine Tool Microscope. For hole location, its wide field of view (¼") or 30x magnification makes it possible to gage accurately to a ten thousandth—*at a glance.*

Mount the Model 11 on an offset bracket or directly in the spindle—it will fit nearly any machine tool. When offset it can be used for transferring hole locations from template to workpiece. The image always appears erect and moves in the same direction as the work, making it ideal for checking contours, slots, surface conditions. The Model 11 Microscope is compact, sturdy, rugged—designed for long life, accurate service.

Write today for complete details.

THE PERKIN-ELMER CORPORATION NORWALK, CONNECTICUT

CIRCLE INFORM-A-GRAM KEY No. 157A

DURANT

INVESTIGATE THE DURANT LINE OF PRESS ROOM EQUIPMENT

INCREASE PRODUCTION! REDUCE COSTS!

THE SELECT-O-MATIC ROLL FEED INDEXER

Replace your present roll feed clutch with this DURANT SELECT-O-MATIC multi pawl indexer that accurately controls close feeding due to its 6720 possible stations.

Write for complete information on our line of economically priced press room equipment

ROLL FEEDS

Choose from seven different models that take stock from 2" to 5" wide — Insures accurate feeding — Reversible — Simple to install.

SCRAP CHOPPERS

Fits all power presses and has simple electrical plug in installation. Low first cost pays for itself —Pennies per day to operate.

DURANT

STOCK OILERS

Prolong die life as they clean and lubricate stock in one operation. Variety of models are available. Eliminates hand oiling yet inexpensive.

STOCK STRAIGHTENERS

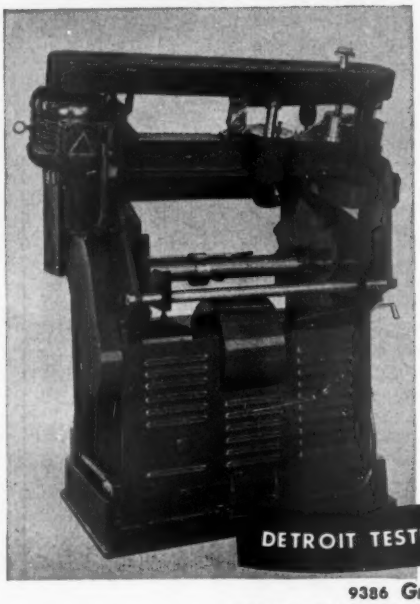
Motor driven equipment (shown) is perfect for thin materials. Top rolls are adjustable for thickness. Standard straighteners also available.

Inquire about our STOCK REELS, FOOT PRESSES, COIL CRADLES, WIRE STRAIGHTENERS, and PRESS FEEDS. Complete free catalog ready now. Write today.

DURANT TOOL SUPPLY CO. 55 ORANGE STREET, PROVIDENCE 3, R. I.

CIRCLE INFORM-A-GRAM KEY No. 157B

semi-automatic Brinell Testing



Cut Testing Labor 50%

You'll only need half your present labor force with this new semi-automatic Brinell testing machine. It spot grinds and makes test impressions automatically, depositing test pieces on the inspectors table at a maximum rate of 400 per hour.

This machine (model RCB) can be adapted for testing crankshafts, gun barrels, or any shaft-like piece. It has a work opening of 30" and is hydraulically operated.

Your inspection department can cut handling and labor costs, as has the production line, with semi-automatic machines. Write for more information today.

DETROIT TESTING MACHINE COMPANY

9386 *Grinnell Avenue, Detroit 13, Michigan*

CIRCLE INFORM-A-GRAM KEY NO. 158A

ENCO TINY TITAN TRADE MARK

NEW! NEW! NEW!

NO. 150 HEAVY DUTY DUPLEX MAGNETIC BASE HOLDER

FOR MOUNTING TEST INDICATORS

Up to 3" in Diameter

Mounts to rods as small as ¾" in diameter, with magnetic pull—125 lbs. Think of that!

Indicator post now firmly brazed to pole piece to insure solidity —an ENCO exclusive.

3-step universal rod in 7/32", ¼" & 5/16" diameters, for all indicators.

V Offset clamp for lugback indicators.

V New fool-proof adaptor.

V Jack-type release & positioning screw.

V Ball swivel and stem of brass & non-magnetic material.

Case, non-breakable Tenite plastic, 1¼" x 4" x 1⅜" high.

Pat. Pending

Shows Model No. 150 being used to indicate workpiece on engine lathe.

Price Complete

$15.50

Attractively Boxed

SEND NOW FOR BULLETIN NO. 605 COVERING OTHER TINY-TITAN TOOLS

No. 100	Magnetic base holder, pull, 65 lbs.	$ 8.00
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No. 130	Precision adjustment magnetic base holder, pull, 65 lbs.	$ 9.50
No. 160	Precision adjustment heavy duty duplex magnetic base holder, pull, 125 lbs.	$17.75
No. 200	Magnetic base "HANDI-LITE", pull, 65 lbs.	$ 8.50
No. 250	Heavy duty magnetic base lighting unit—holds 100 watt bulb, pull, 125 lbs.	$18.50

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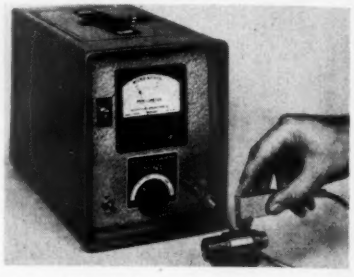
ENCO MANUFACTURING COMPANY, Dept. 724
4520-26 W. Fullerton Ave., CHICAGO 39, ILL.

Order from your Enco Stocking Dealer, or send order with name of your mill supply dealer.

CIRCLE INFORM-A-GRAM KEY No. 158B

Profilometer Amplimeter. This new instrument shows either the r.m.s. or arithmetical average rough-

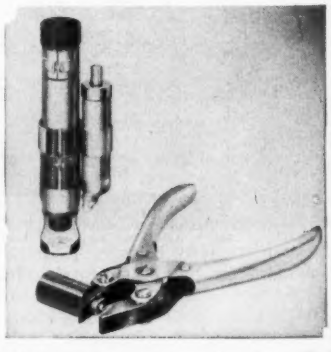


ness height in microinches as selected by a switch on the panel. Features, controls and shop applications are described and shown in Bulletin LT86, available on request from Micrometrical Mfg. Co., 345 S. Main St., Ann Arbor, Mich.
Circle Inform-A-Gram No. A36.

Heavy-Duty Etcher. This instrument has found wide acceptance as a production line etching tool and also in tool rooms where heavy parts are marked. Its wide range of heats make it suitable for use on small

parts or (on one of the highest heats) for marking large pieces such as crowbars, shovels, castings, etc. For detailed information write the manufacturer, the Martindale Electric Co., 1375 Hird Ave., Cleveland 7, Ohio, or—**Circle Inform-A-Gram No. A37.**

A New Precision Type Sheet Metal Hardness Tester, Model 317, offers a more precise method of testing the hardness of all types of sheet metal,



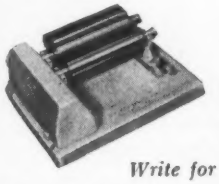
both ferrous and non-ferrous. It is made by the Pacific Transducer Co., 11921 W. Pico Blvd., Los Angeles 64.
Circle Inform-A-Gram No. A38

Announcing

the NEW 24 inch SPITFIRE FLAT LAPPING MACHINE

LOW COST PRECISION LAPPING AT PRODUCTION SPEED

A NEW, large size Flat Lapping Machine of improved design for precision lapping of any material where a perfectly flat surface is necessary. Extremely close tolerance finishes are possible. An ideal machine for producing mating surfaces of sliding and rotating parts of air and liquid tight seals, plastic and die casting molds.



SPITFIRE ROLLER LAPPING MACHINE

For lapping cylinders to accurate, mirror-like finishes in less time than any other method. Saves up to ⅔ time in lapping.

Write for Brochures, Prices and Delivery

SPITFIRE TOOL COMPANY
2935 N. Pulaski Rd. Chicago 41, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 159A

Star Performer In The Reamer Field

Staples

CARBIDE-TIPPED SHELL TYPE EXPANSION REAMER*

For maximum tool life with minimum tool servicing, put this Staples Shell Type Expansion Reamer on the job. Tool is returned to original diameter simply by driving the shell up the tapered arbor. Tool can be expanded many times without a regrind. To obtain a new tool, just order a new shell—a standard stock item.

Standardize on Staples Carbide-Tipped Circular Cutting Tools. You'll get longer tool life—greater accuracy—finer hole finish—and spend less time on tool servicing. Staples is the *quality* name in carbide tool production. You'll save money in the *long* run with Staples.

*Patented.

THE STAPLES TOOL COMPANY, Cincinnati 25, Ohio
Distributors in Major Cities
Staples CARBIDE-TIPPED CUTTING TOOLS
A complete line of Circular Carbide-Tipped Cutting Tools Expansion Reamers — Special Tools

CIRCLE INFORM-A-GRAM KEY NO. 159B

Severance CARBO-MILLS GROUND-from-the-Solid

The all-purpose CARBIDE mill at LOW cost. Use them same as you would High Speed mills or Rotary Files—Same machines—Same speeds (or higher). No more, time consuming, "kid-glove" care. Just chuck them up in your regular equipment and watch these RUGGED CARBO-MILLS go to work!

SOLID CARBIDE CUTTING HEADS

CARBO-MILLS ASK NO SPECIAL FAVORS

3/32" SHANKS
7 Standard Numbers, featuring REAL cutting teeth to remove stock faster over long periods of use—as well after regrinding as when new.

CARBO-MILLS by the ORIGINATOR of Ground-from-the-Solid Mills

IN PORTABLE TOOLS

1/8" SHANKS
12 STANDARD NUMBERS
THE POPULAR WORK BENCH SET

NO PROBLEM OF TOOTH CHIPPING OR BRAZE-FAILURE

CARBO-MILLS PREFERRED BY OPERATORS!

1/4" SHANKS
20 STANDARD NUMBERS

IN MACHINE TOOLS

20 Standard Numbers (only 9 illustrated) cover the widest possible range of uses. Don't continue losing valuable time and money; replace your less efficient Rotary Files with these longer lasting, faster cutting, stamina possessing, CARBO-MILLS at the earliest possible moment!

LAST UP TO 75 TIMES LONGER THAN ROTARY FILES OF HIGH SPEED

REGRINDING – Due to CARBO-MILLS being made of Solid Carbide repeated savings are made possible through successive regrinds.

INVESTIGATE NOW!
FOR COMPLETE INFORMATION AND PRICES SEND FOR BULLETIN CM.

DIE MAKERS! ASK FOR THIS SET

Furnished to you in a sturdy wooden case, Di-car Set No. 40 is a set of 8, ¼" shank CARBIDE mills designed and instituted specifically for you, the Tool and Die Maker. Specially selected shapes – Special tooth patterns and cuts for all types of precision Tool and Die work. You will ply your skills easier and faster than ever before with these personal finishing mills. These CARBIDE mills need absolutely no coddling and will win their way to the the most favored spot on your Work-Bench! Send for complete information and prices today! Ask for Leaflet No. 645

· · · GROUND-from-the-Solid · · ·

SEVERANCE TOOL INDUSTRIES, INC.
730 IOWA AVE. SAGINAW, MICH.

CIRCLE INFORM-A-GRAM KEY No. 159C

TAP BREAKAGE Reduced

The DAHLSTROM TAP GUIDE practically eliminates tap breakage and saves wasted hours getting broken taps out of expensive dies. It does the job in a jiffy with work always straight and true. Carry it over to your big work, or fasten it to a post, slip a Tap Adaptor into the spindle, and even an inexperienced operator can handle it. Equipped with 9 adaptors, ranging from 8-32 to ¾". Spindle has center in top end to go in tail stock of lathe. Or use it as a tap extension for hard-to-get-at-places.

$59.50 F.O.B. FACTORY

for HAND TAPPING *or* LATHE USE

WRITE FOR CIRCULAR

BRANCH MFG. CO.
NORTH BRANCH, MINNESOTA

Dahlstrom TAP GUIDE

CIRCLE INFORM-A-GRAM KEY No. 159D

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Solid Carbide
DRILLS
and
REAMERS

RAYMAC drills cut hardened metal . . . do not burn or anneal. Feature operational speeds of 350 to 600 RPMs depending on size and hardness of metal.

RAYMAC solid carbide reamers are custom designed for individual jobs. Our engineering department is at your service to solve your reaming problems.

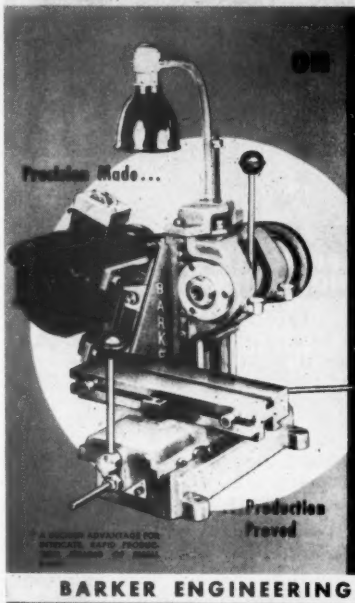
Write for catalog No. 12.

RAYMAC
MANUFACTURING COMPANY INC.
3729 CASS AVENUE, DETROIT 1, MICH.

CIRCLE INFORM-A-GRAM KEY No. 160A

All these operations

MILLING, PROFILING, DRILLING, KEY SEATING, END MILLING, STRADDLE MILLING, SLOTTING, TURNING, FACING, COUNTERBORING & RECESSING



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Bench Type
MILLS
with Exclusive
3-WAY
Hand Lever Travel

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BARKER ENGINEERING COMPANY
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OPTICAL
COMPARATOR
CHARTS
New
16 PAGE

Catalog-Price List covering hundreds of stock standard precision plastic charts for every make and model of projector and comparator.

SENT FREE UPON REQUEST
Catalog No. 53-70

GAGE COMPANY
BATTLE CREEK, MICHIGAN

CIRCLE INFORM-A-GRAM KEY No. 160C

IMPORTANT NOTICE

The Genuine MAUSER
VERNIER CALIPER
IS NOW MADE OF
STAINLESS STEEL
THROUGHOUT

The fine finish will not tarnish or deteriorate in many years of use.

NEW #101

$14.75 POSTPAID

. . AND THE FOLLOWING IMPROVEMENTS HAVE BEEN ADDED

★ A SPECIALLY LONG VERNIER to read the thousandths
★ A HARDENED PHOSPHOR-BRONZE adjustable gib retains accuracy
★ 3 EASY READING SCALES • 1/1000" • 1/128" • 1/10 mm. in back

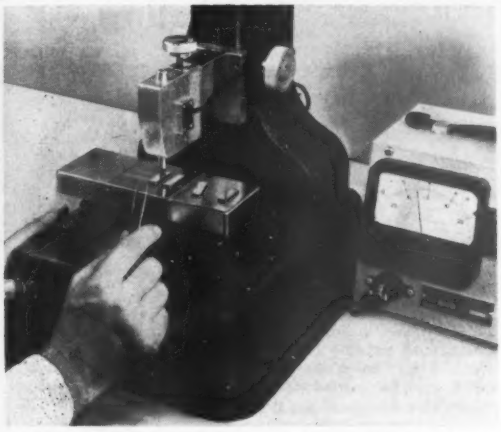
Request Illustrated Folder showing complete line of MAUSER Toolmakers Calipers, Height gages, Bevel Protractors and Tool Stands.

Dealers: Here's a real profitable line!

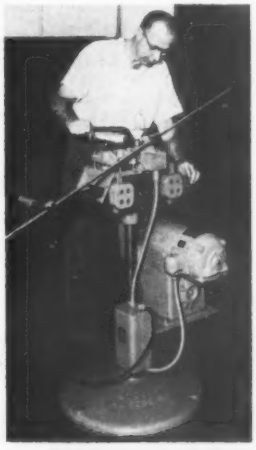
GEORGE SCHERR CO., INC.
COMPLETE LINE OF PRECISION INSTRUMENTS
200-T LAFAYETTE ST. • N.Y. 12, N.Y.

CIRCLE INFORM-A-GRAM KEY No. 160D

Half-Millionths of an Inch. Dimensional gaging in increments of one-half-millionth of an inch (0.0000005") is provided by the Half-Millionths Micro-AC Electronic

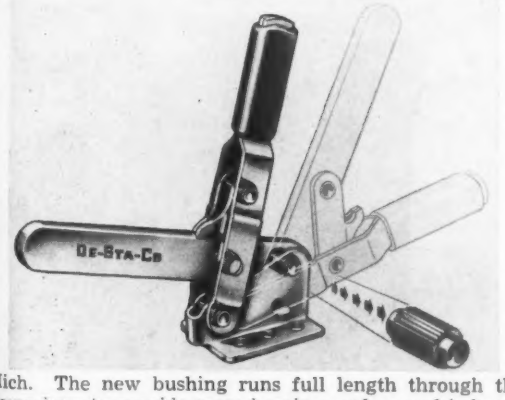


Microcomparator now being produced by the Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio. Full details and specifications given in Bulletins 535 and 536. **Circle Inform-A-Gram No. A39.**

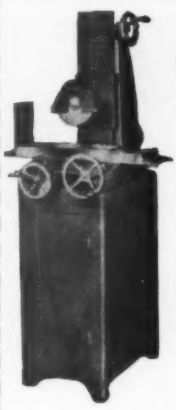


This Light Duty Power Driven Straightener has a variable speed drive unit that makes it a simple matter to control the output speed to conform to the requirements of the job. The straightener also can be employed for material which comes in strip form. It is suitable for material up to 6" width and ⅛" maximum thickness in cold rolled steel. Details and specifications are available from U. S. Tool, Inc., Ampere (East Orange) N. J.
Inform-A-Gram No. A40.

Toggle Clamp Bushing. A new type bushing for four series of heavy duty toggle clamps is now being produced by the Detroit Stamping Co., 344 Midland, Detroit 3,



Mich. The new bushing runs full length through the clamp bars to provide more bearing surface and is hardened to resist wear. The bushing is serrated and locked in the clamp bars so that it will not turn and work lose. Write to Detroit Stamping Co. for further details.
Circle Inform-A-Gram No. A41.



The Original

12" Precision Surface Grinder

- The Most widely used Precision Grinder
- Used extensively in America's finest tool and die shops
- Extremely accurate for sections in lamination, progressive dies, gages, etc.

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1744 N. KIMBALL AVE. ◊ CHICAGO 47, ILL.

MANUFACTURERS OF THE TML PRECISION GRINDER

CIRCLE INFORM-A-GRAM KEY No. 161A

SOLVE YOUR HOLE ACCURACY PROBLEM with *Horberg* PRECISION PIN GAGES

EXCLUSIVE CONCENTRIC ENTRY TAPER for faster, more definite inspection of holes, for greater ease in centering. Gage sets supplied for all common drill sizes.

TOLERANCE +0.0001 -0.0000

SETS: Two gages in each size, with convenient stand.

Index Set (A-Z) 52 Gages $50.00

Number Set (1/64-½" in steps 1/64) 60 Gages 56.00

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ALL SHIPMENTS FROM STOCK

THE *Horberg* GAGE COMPANY

Division of Horberg Grinding Industries, Inc. Complete Stock, Bridgeport, Conn.

Please send Horberg Pin Gage Catalog to

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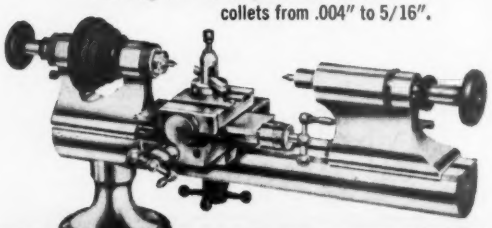
SMALL INSTRUMENT PARTS ARE MADE BEST
ON LEVIN® LATHES

Twenty-three models for all types of work. 4" swing, Bed Length 12" or 18"; over 100 stock sizes of collets from .004" to 5/16".



Send for Catalog L describing Lathes for tool work, second operations; turrets and full line of accessories.

LOUIS LEVIN & SON, INC., 782 E. PICO BLVD., LOS ANGELES 21, CALIF.

CIRCLE INFORM-A-GRAM KEY NO. 162A

Drill Hardened Steels without Annealing—

With the new, improved "HARDSTEEL" Drill, you can do accurate, smooth drilling, countersinking, counterboring and reaming in steels hardened by any process without first annealing the work. And they work with equal ease on work-hardening steels and high carbon–high chrome steels of any degree of hardness.

"HARDSTEEL" Drills fit standard drill presses. They save time and reduce rejects. They permit engineering changes requiring additional drilling after hardening. And parts drilled after hardening always match at assembly.

Write for a copy of the "HARDSTEEL" Operators Manual showing how "HARDSTEEL" drills are cutting costs in thousands of plants.

You Harden It—We'll Drill It—
With "HARDSTEEL"

BLACK DRILL COMPANY, INC.
1568 East 222nd St. • Cleveland 17, Ohio

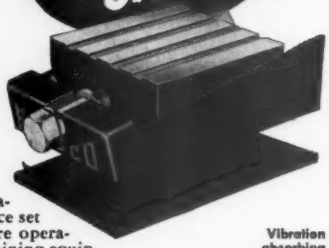
Also makers of—
BLACK DRILLING UNITS—AUTOMATIC, SELF-CONTAINED—FOR COST-CUTTING PRODUCTION ON ALL MATERIALS
Write for information

CIRCLE INFORM-A-GRAM KEY NO. 162B

Here's how to SAVE TIME in SETTING-UP and KEEPING your MACHINES LEVEL

Fast
Accurate
Self-Aligning
Machine Leveler

Empco JACK



Empco Jacks enable you to meet hurry-up demands for relocation of machinery by giving you the fastest, easiest, most accurate machine leveling ever known: you simply raise or tilt machine sufficiently to allow the Empco Jacks to be slipped under base. The number of jacks required depends on weight of machine and size of base. Once set on Empco Jacks, the entire operation of leveling and maintaining equipment level is quickly done. By applying a wrench to the "hex" head of adjusting screw, an adjustment is obtained either up or down until your level indicator reads "zero." Write for specifications and prices today.

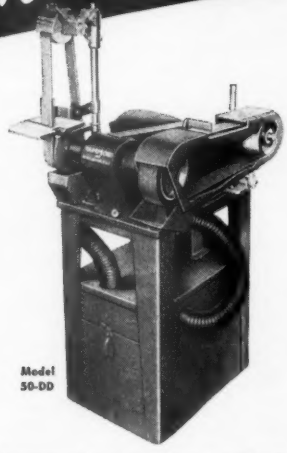
Vibration absorbing mounting pads increase machinery life.

EMPCO PRODUCTS

THE ENTERPRISE MACHINE PARTS CORPORATION
2735 JEROME AVENUE • DETROIT 12, MICHIGAN

CIRCLE INFORM-A-GRAM KEY No. 162C

DE BURR ING Made Easy!



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FLAT WORK

CONTACT WHEEL

CONTOURED PARTS

HARD-TO-GET AREAS

It is amazing how soon these Abrasive Belt Machines pay for themselves.

11 combinations available with or without Duskolector.

"Clip" this ad to your letterhead. 20 page catalog will be sent at once.

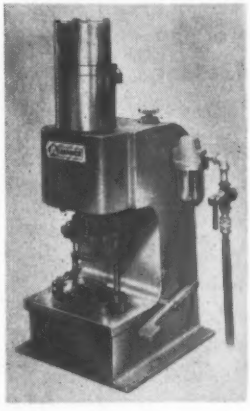
Hammond Machinery Builders, Inc.
1631 DOUGLAS AVENUE KALAMAZOO, MICHIGAN

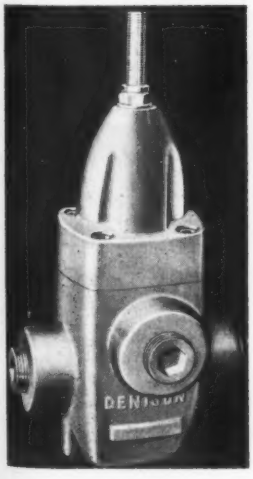
CIRCLE INFORM-A-GRAM KEY No. 162D

Coolant Pump. New compactness and convenience are provided in the inexpensive coolant supply unit offered by Wade and Sons, 988 E. Truman Rd., Independence, Mo. It can be installed in a half-hour or less and no separate motor is required. Because the unit is driven by the drill press motor, which is higher than the coolant supply, the danger of electrical shock is virtually eliminated. Longer drill life, better size control. **Inform-A-Gram No. A42.**

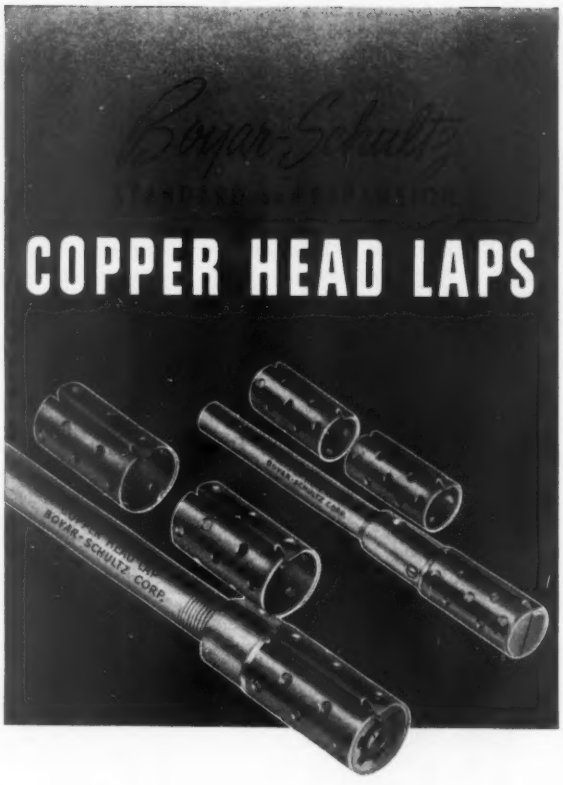
Saw & Band Filer. A new, a l l - purpose combination contour saw and band filer has been developed by the Boice-Crane Co. This modern-method machine permits time savings in cutting, filing and file broaching of small run production parts; maintenance parts; irregular shaped stacked parts; spiral parts, tools, templates and stampings and forming and trimming dies. A brochure on this new equipment is available from the Boice-Crane Co., 963 Central, Toledo 6, Ohio. **Circle No. A43.**

New Bench Press. A bantam size, air-oil combination hydraulic bench press, capable of delivering 5 tons of pressure when connected to a 100 psi air line has been developed by the Alliance Mfg. Co., Alliance, Ohio. The principal advantages of this press are its compactness, flexibility and economy of operation. The press is especially suited for staking, riveting, forming, piercing, crimping, sealing, broaching, trimming, m a r k i n g and flanging. Further information is available upon request. **Circle No. A44.**





Direct-Operating Sequence Valves, suitable for operation in circuits from 25 to 2,000 psi, are part of a new line of controls now available from The Denison Engineering Co., 1197 Dublin Ave., Columbus, Ohio. The v a l v e s provide precision control for inter-locked hydraulic operations, insuring close synchronization of primary and secondary operations. They are easily adaptable to a variety of remote control operations by rearrangement of pipe plugs. Valves are supplied in threaded body style in ½", ¾", and 1¼" sizes. **Inform-A-Gram No. A45.**



BOYAR-SCHULTZ COPPER HEAD LAPS are accurate, fast working and easy to use. They are much less costly than making laps in your own tool room. Because the only wearing part is the inexpensive copper sleeve, they are long lasting.

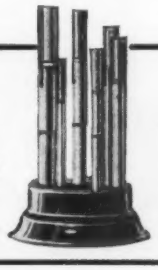
Unlike laps made for specific jobs, they are used over and over again, changing only the sleeves. Adjustment permits correct lapping size to be maintained till sleeve is worn out and replaced with a new one. Thus, with Boyar-Schultz Copper Head Laps you save tool room time and get accurate speedy lapping.

Copper Head Laps and Sleeves are immediately available from stock, in standard sizes—⅛" to 2½" diameters.

Write for circular

SPECIAL TOOL MAKERS BENCH LAP SETS

A time saving set in Tool & Die work. Set consists of seven most commonly used sizes - 1/8" - 3/16" - 1/4" - 5/16" - 3/8" - 7/16" - 1/2", with enameled die cast base.



BOYAR-SCHULTZ CORPORATION

2112 Walnut Street, Dept. B-L, Chicago 12, Illinois

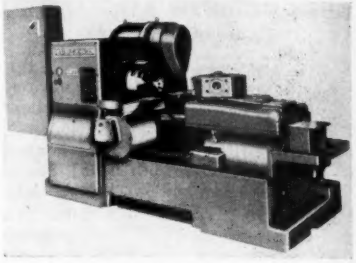
CIRCLE INFORM-A-GRAM KEY No. 163

AUTOMATIC LATHE DESIGNED FOR CARBIDE TOOLING

A new high powered automatic turret lathe, designated the Model 4U and designed primarily for rapid removal of metal with modern carbide tools, has been announced by Potter & Johnston Company, Pawtucket, Rhode Island.

An 8 inch type A-1 American Standard spindle nose, has been adopted for the rugged spindle, taking chuck sizes 10, 12, or 15 inches. Four automatic instantaneous speed changes are provided and through pick off gears, spindle speeds ranging from 45.5 to 1177 rpm can be obtained. A large magnetic clutch and brake, designed to give cushioned starting and stopping of the spindle, allows greater flexibility in operation. These features together with a 25 hp motor enable the Model 4U to take full advantage of modern carbide tooling thus assuring fast metal removal on the toughest materials.

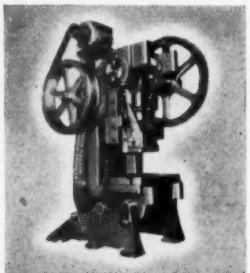
The large, six-faced turret is indexed with a smooth acting geneva movement and is accurately positioned by means of a large lock bolt. A tapered seat clamping arrangement in the turret slide has a travel of 12 inches, of which 8 inches is feed. In addition, the slide is also adjustable along the base ways giving much greater tooling possibilities. The design of the turret is such that coolant may be pumped either overhead for turning tools, or through the bars for boring and drilling.



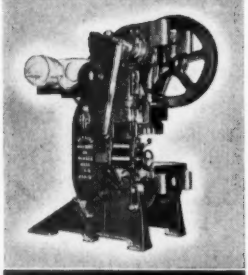
All machine functions, including automatic changes of speeds, feeds, rapid traverse and automatic stopping of the machine are controlled from a conveniently located dog drum.

The Model 4U is designed so that the following attachments can be easily applied: Slow spindle speed for drill head pick-up; slow spindle speed for spindle positioning; and reversing spindle for right or left threading with automatic tap withdrawal.

Circle Inform-A-Gram Key No. D2.

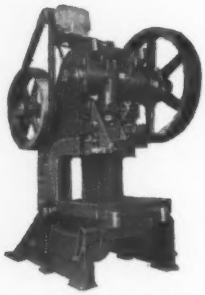


#700 B GEAR PRESS



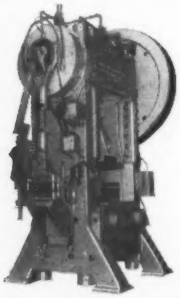
650-B PLAIN FLY WHEEL

No. 10M FLYWHEEL PRESS



No. 800B GEARED INCLINABLE PRESS

Illustrating a few of the many types and sizes of standard Perkins Presses. Presses built to customers' special specifications.



No. 12-H-36 STRAIGHT SIDE, SINGLE CRANK TIE-ROD CONSTRUCTION PRESS CAPACITY 200 TONS

Perkins Power Presses SINCE 1885

PERKINS MACHINE CO.
WARREN, MASSACHUSETTS

CIRCLE INFORM-A-GRAM KEY No. 164

BURG TOOL OPENS MIDWESTERN OFFICE

The opening of the Midwestern Burgmaster Machinery Co. in Chicago, under the management of R. A. Gorman, has been announced by the Burg Tool Mfg. Co. of Los Angeles. The new office will be devoted exclusively to the sale and service of Burgmaster products in the Midwestern states, including Illinois, Indiana, Missouri, Iowa, Kansas, Nebraska, Minnesota and Oklahoma.

R. A. Gorman

JET ENGINE BLADE OUTPUT INCREASED BY OIL FILTRATION

An ideal opportunity to compare operations with and without the benefits of oil filtration presented itself when a new grinding department was set up at the Precision Forging Division of the Utica Drop Forge and Tool Corporation at Utica, N. Y. The company had started production of precision forged jet engine blades in Nimonic 80 stainless steel. A pilot run was set up before complete production facilities could be installed. Therefore two form grinders with insufficient filtering equipment were set up for temporary production until eight additional grinders and an adequate central oil filtration system could be delivered and installed.

On this basis, the oil used by the two grinders in forming the jet engine blades became heavily contaminated after brief use. A sludge load consisting mostly of metal particles was deposited on the grinding surfaces of the wheels where the metallic slivers became imbedded in the wheel faces. This made frequent dressings imperative. The fixtures for holding the parts also required repeated cleaning to remove the sludge so that the blades could be accurately positioned. Contaminated oil on the wheel surfaces burned many parts causing a high percentage of rejects. The oil temperature climbed and created noxious fumes which pervaded the area around the grinders. Two diamond dressers are used in each grinder to maintain the profile on the abrasive wheels. Largely because of contamination eight sets of diamonds had to be used on each machine every eight hours for a cost of $496. Although these circumstances had been foreseen by Utica Drop Forge, they serve to illustrate the high operational losses which can occur where effective filtration is not employed. After the grinding department was completely equipped for standard production the problems disappeared. The final installation consisted of ten form grinders—four Jones & Lamsons and six Excellos. The filtration system is made up of three U. S. Hoffman pressure filters Model 1-80-S with a flow rate of 140 gallons per minute, mounted on a three-compartment settling tank with a sludge removal conveyor. A continuous supply of clear pure oil was delivered to the grinders at all times. By keeping the grinding wheels free of metallic particles wheel dressings were reduced 95½%. The cost for diamonds fell to $62 for six machines, which was the average number in operation each day, as compared to the previous $496 for two machines. A further advantage of the oil filtration system was the elimination of sludge on the holding fixtures which saved considerable cleaning time. The filtration system provided a large oil capacity which, coupled with an absence of friction-creating contaminants, allowed the oil temperature to drop back to normal thereby eliminating the noxious fumes.

All these improvements led to a considerable decrease in rejects

MODEL J
10" x 18" Capacity

Check its

✓ CAPACITY
✓ STRENGTH
✓ 3-Point Suspension
✓ Safety
✓ Centralized CONTROL

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JOHNSON MANUFACTURING CORP.
ALBION, MICHIGAN

CIRCLE INFORM-A-GRAM KEY No. 165

and in addition boosted production substantially. A total of 6000 gallons of dirty oil which had been accumulated in storage during nonfiltration operations was reclaimed by putting it through the system and restoring it to its original condition. This oil is now used to make up gradual losses in the system and represents a saving of $3,600.

The oil used in the grinders has a high viscosity of about 300 SSU at 100° F. Grit from the wheels, metal particles, dust, dirt and other contaminants are held in suspension. The repurification cycle begins as the oil leaves the grinders and goes to the first section of the settling tank. The detention time there is ten minutes to allow most of the metal particles to settle out. A continuous-chain conveyor with a flight of scrapers removes the sludge that settles in the bottom of the tank, drags it up an incline to allow maximum oil drainage, and empties it into a disposal cart for easy removal. The oil is then pumped up from the tank through the three Hoffman pressure filters which are equipped with fine mesh screens precoated with filter-aid powder. From there the repurified oil is returned to the grinders, ready for use once more.

Each pressure filter tank is bypassed out of the system for 20 minutes a day to permit cleaning and recoating of its screens. The screens are scraped down by an externally operated device which is part of the filter mechanism. The pressure filters are mounted over the settling tank to conserve space, and to allow the spent precoat powder and impurities to drop by gravity into the tank and be carried off with the metal particles.

Although the filtration of fluids can and should be a highly important factor in almost every industry, it is surprising how little is known or practiced in many plants. Millions of dollars worth of fluids which are still being dumped as waste by industrial firms can be reclaimed by modern filtration methods. Moreover, this equipment is readily available and usually pays for itself in a short time. Filtration is used most commonly for restoring to their original condition the many oils used for coolants, grinding and cutting, running-in, honing and lapping, quenching, circuit breakers and transformers, diesel and fuel oil, and rolling mills. Many other fluids, including parts washing solvents and industrial waters, are also filtered. The usual contaminants in these liquids are metal particles in the form of chips, turnings, powder or rust, dust, dirt, lint, abrasive grits, water, entrained air, carbon and fuel dilutions, and oil oxidation products such as resins, gums, organic acids and asphaltenes. Care must be taken when removing the undesirable foreign matter not to filter out rust inhibitors and other valuable additives.

A number of mechanical principles are employed to remove the various impurities—either individually or in combination.

These include flotation, gravity settling, filtering through various types of material, and vaporization distillation. Other methods include filtration, magnetic separation, and vacuum distillation. U. S. Hoffman equipment utilizing these principles has been designed in a complete range of

For All Sheldon Lathes less than 5 Years old...we have just published a new Parts List Manual, with:

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SHELDON MACHINE CO., INC.
4235 North Knox Ave., Chicago 41, Illinois

CIRCLE INFORM-A-GRAM KEY No. 166

models to serve the specific needs of industry. This apparatus may consist of a single compact unit attached to an individual machine, a mobile unit which moves from one machine to another, or a large central filtration plant handling fluids for an entire department.

The main advantage of filtration are the conservation of the liquids themselves, and the reduction of downtime for production machinery. Other benefits are less tool loading and increased life of tools, reduced number of rejects, better quality work, cleaner factory conditions, and a reduction of shipping, storage and disposal costs.

Carbide Tipped Die Drill Performs Salvaging Operation

A Whitman & Barnes carbide die drill was recently put to an unusual test by the Victor Equipment Co., San Francisco, California.

While tapping a stainless steel regulator body, with a high speed precision ground tap, the tap became lodged in the part and could not be removed by any means at their disposal. The flutes were clogged with chips.

Photo courtesy Whitman & Barnes Division of United Drill and Tool Corporation.

Fortunately, it was a through hole and it was suggested that a die drill, ⅜" in diameter be used. The tap was successfully drilled to a depth of ½". The flutes were then easily broken off and the tap removed.

The drill was operated dry and an excessive surface feet per minute was used, so that the drill became nearly white hot, yet the braze did not fail.

The part was valued at $125.00 and would have otherwise been scrapped. This is but one of many examples of costly parts that have been salvaged through the use of Whitman & Barnes die drills, which are able to drill hardened steels.

Chrome Plated Height Gages

Stainless steel height gages with chrome plated graduations are being introduced by the Foster Supplies Company. The graduations on the measuring beam and vernier scale are easily read because they stand out in great contrast against the dull chrome background which also serves to eliminate distracting and eye-straining reflections from surrounding lights.

The combination of chrome plate on stainless steel makes the height gages impervious to rust and finger acidity. Other design features, i. e., long slides, large bases, and heavy beams contribute to extreme accuracy and stability. The beams are completely hardened to resist wear. Six different sizes cover a range of from 12 to 48 inches.

Why carry the horsepower?

USE haskins FLEXIBLE SHAFT TOOLS
FOR ALL grinding · sanding · filing · polishing

Why burden skilled hands with the chore of manhandling bulky, heavy, conventional grinders? Haskins flexible shaft equipment furnishes all the power required for the job—without the weight. And the Haskins line includes models with horsepowers, speeds, tools and attachments that will exactly suit your job. Write for the latest catalog which describes all models.

HASKINS

R. G. HASKINS COMPANY

605 S. Washtenaw Avenue, Chicago, Illinois

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Let us Prove . . .
★ Faster cutting, even on hardened steel or abrasive surfaces!
★ Superior finishes!
★ Increased production and reduced tool costs!

Job-engineered for greater production profits!

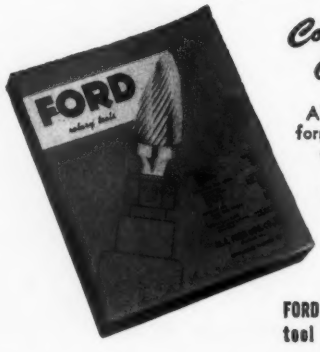
FORD

solid CARBIDE END MILLS

On-the-job tests of FORD solid carbide end mills confirm their superiority! Greater rigidity, job-engineered spiral flutes and cutting edges, and close tolerances all contribute to faster, better production and lower costs. Sizes to ½". See new catalogue No. 207.

FORD -- *the complete line!*

HSS ground cutters, rotary files, countersinks
CARBIDE cutters, end mills, grinding burs



Complete Details, Operating Data

All specifications, plus informative operational data on more than 300 FORD stock rotary tools contained in new FORD catalogue No. 207, just released. Send for YOUR copy.

FORD regrinding service adds new tool life, reduces tool costs!

M. A. FORD MFG. CO., INC.
Pioneers in rotary tools for more than 30 years
DAVENPORT 1, IOWA
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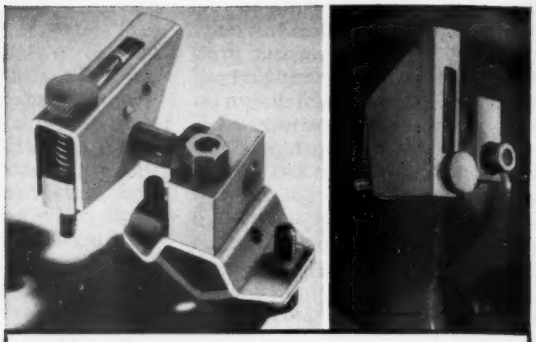

PEKAY "Depthmaster" • Mounted on Turret Hand Wheel

Gives You Bore Depth Control to 1/1000" on Any Machine Tools Where Stops Are Used

You can eliminate costly secondary operations, yet hold bore depths to close tolerances, with this *non-mechanical* method of measuring pressure against stops. Reduces machine adjustments to a minimum—speeds up original set-ups. Progressive errors are impossible—no spring-loading or other moving parts, so no fatigue or failure. It can be installed on any tool with a stop—turret lathe, hand screw machine, drill press, etc.—in one minute or less. *Now being used with great success in plants all over U. S.*

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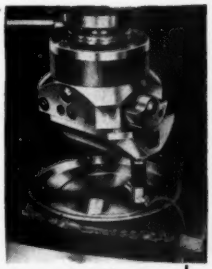
ONE Tool
ONE Set Up

. . . for boring, facing, turning, recessing, undercutting.



MASTERHEAD
THE BORING AND FACING HEAD THAT THINKS FOR ITSELF

Featuring: automatic feeds, end release and return; adjustable stop; adaptable to all standard machines; highest precision; ideal for jig borers; nine models for work up to 36¼" diameter.

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CIRCLE INFORM-A-GRAM KEY No. 168C

THREAD TRIANGLES

One set of these new thread measuring tringular bars quickly checks all 60° standard and special threads from 4-56 pitch any O.D. Prices complete with plastic chart and carrying case . . . $8.60
Circle informagram for latest bulletin "Thread measuring made easy".

MONTGOMERY TOOLS **MONTGOMERY & CO.**
24 AUSTIN ST., NEWARK 5, N. Y. Bigelow 8-1045

CIRCLE INFORM-A-GRAM KEY No. 168D

. . . Tool Evaluation, from page 47

the exact time of the varying degrees of tool breakdown. Faxfilm is a cellulose tape in which an imprint of the surface finish may be made with the use of a solvent applied to the test log and allowed to dry for several seconds. Then the tape is rolled over the solvent, carefully avoiding air bubbles and dried for a minute or so after which it is removed and placed in a folder the size of a 35 millimeter camera slide. The slide can be projected on a screen for viewing, or enlarged and printed for permanent record, Figure 6. By the Faxfilm method an amazing amount of detail can be obtained showing the action of the tool. Under certain conditions and with various grades of carbides the tool will start with a cutting action and generally change to a burnishing action. Faxfilm records this and the time of change may be calculated.

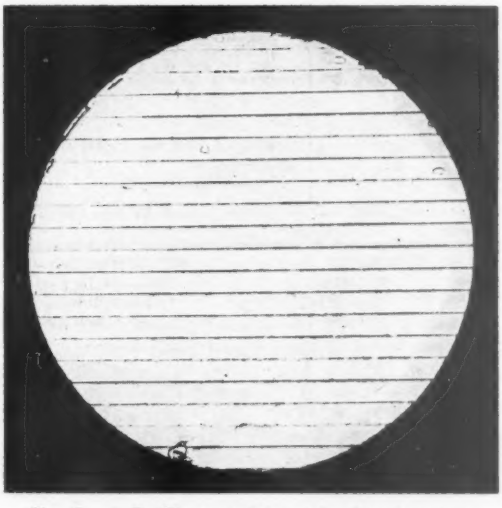

Fig. 6. A Faxfilm record is made of tool action.

In process testing the finish on the test log is measured in R.M.S. and the following wear points in thousandths of an inch: flank wear, top wear, crater land, depth of crater and compression. All testing is done without a coolant.

Numerous tests have been made and are being made on carbides other than tungsten and also on borides. The new metals (tantalum, titanium, molybdenum and zirconium) have also been used as test logs.

This method of Tool Life Evaluation and recording of information not only determines the cutting ability but also the degree of cutting ability which makes economic comparisons possible for the consumer. In addition this measurement of comparison benefits the manufacturer by making it possible to measure the effectiveness of change in processes.

It's the Teeth That Tell

It's the "teeth" in Weldon End Mills that tell the story of more production and bigger profits on your jobs.

Weldon pioneered in producing *scientifically designed* teeth for end mills, a step over 25 years ago that opened the door to higher speeds, and faster feeds.

Call the Weldon representative.

After lengthy experiment and study, the *tooth shape* and *spiral angle* on Weldon End Mills were radically altered from conventional styles. The result was a tooth that *allows chips to curl out without clogging* and *insures better performance* and *longer life for the tool.*

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WELDON Distributors throughout U. S. A. and Canada carry complete stocks to serve you

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"I don't care if it is the fastest! I still can't drill your teeth with Columbia's CLARITE High Speed Steel."

COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILL.

Producers of fine tool steels — All types immediately available through Sales Offices, Warehouses and Representatives in Principal Cities.

TOOL COLUMBIA STEELS

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Sold Thru Leading Supply Houses

GROBET CHATTERLESS COUNTERSINKS

They are terrifically popular because the six staggered cutting edges are scientifically designed to give a shearing cut and thus eliminate all chatter. Made in 12 sizes in all degrees; also supplied as sets in strong Kit-cases.

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Five senior models . . . many special-purpose constructions. 50 to 200 times air line pressure. **Wedge-&-Lever Action** utilizes total cylinder drive . . . delivers greatest power grip on the work. Pat'd. Exceptional rigidity particularly suited to work-holding on **CARBIDE MILLING** and almost all milling operations. AIR OR HYDRAULIC. Write for data sheet.

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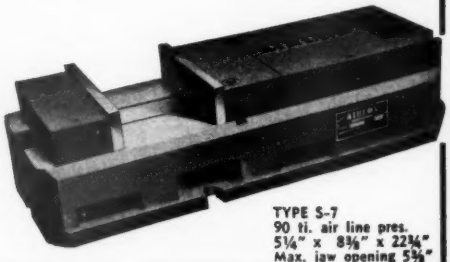

TYPE S-7
90 ti. air line pres.
5¼" x 8⅜" x 22¾"
Max. jaw opening 5⅜"

CIRCLE INFORM-A-GRAM KEY NO. 170C

MICRO-HEIGHT GAUGE

NOTHING COMPARES FOR FAST ACCURATE LAYOUT AND INSPECTION.

A precision built height gauge with direct capacities from zero at base to 3" in thousandths. It scribes, it measures distances between holes or surfaces, it makes fast and accurate inspection possible. Finished in durable satin chrome. Can be supplied with our new 3" hardened, ground and lapped standard riser which extends the range to 6". *Write for circular and prices.*

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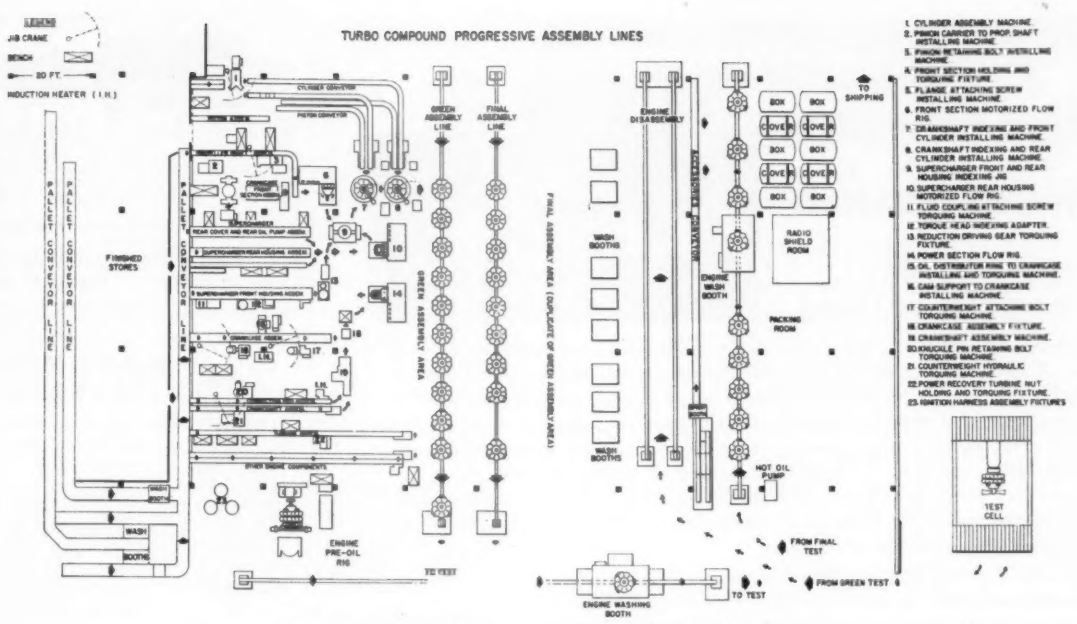
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FINISHED STORES
WASH BOOTHS
ENGINE PRE-OIL RIG
TO TEST
GREEN ASSEMBLY LINE
FINAL ASSEMBLY LINE
GREEN ASSEMBLY AREA
FINAL ASSEMBLY AREA (DUPLICATE OF GREEN ASSEMBLY AREA)
ENGINE DISASSEMBLY
ENGINE WASH BOOTH
RADIO SHIELD ROOM
PACKING ROOM
HOT OIL PUMP
FROM FINAL TEST
FROM GREEN TEST
TO SHIPPING
TEST CELL
ENGINE WASHING BOOTH
1. CYLINDER ASSEMBLY MACHINE.
2. PINION CARRIER TO PROP. SHAFT INSTALLING MACHINE.
3. PINION RETAINING BOLT INSTALLING MACHINE.
4. FRONT SECTION HOLDING AND TORQUING FIXTURE.
5. FLANGE ATTACHING SCREW INSTALLING MACHINE.
6. FRONT SECTION MOTORIZED FLOW RIG.
7. CRANKSHAFT INDEXING AND FRONT CYLINDER INSTALLING MACHINE.
8. CRANKSHAFT INDEXING AND REAR CYLINDER INSTALLING MACHINE.
9. SUPERCHARGER FRONT AND REAR HOUSING INDEXING JIG.
10. SUPERCHARGER REAR HOUSING MOTORIZED FLOW RIG.
11. FLUID COUPLING ATTACHING SCREW TORQUING MACHINE.
12. TORQUE HEAD INDEXING ADAPTER.
13. REDUCTION DRIVING GEAR TORQUING FIXTURE.
14. POWER SECTION FLOW RIG.
15. OIL DISTRIBUTOR RING TO CRANKCASE INSTALLING AND TORQUING MACHINE.
16. CAM SUPPORT TO CRANKCASE INSTALLING MACHINE.
17. COUNTERWEIGHT ATTACHING BOLT TORQUING MACHINE.
18. CRANKCASE ASSEMBLY FIXTURE.
19. CRANKSHAFT ASSEMBLY MACHINE.
20. KNUCKLE PIN RETAINING BOLT TORQUING MACHINE.
21. COUNTERWEIGHT HYDRAULIC TORQUING MACHINE.
22. POWER RECOVERY TURBINE NUT HOLDING AND TORQUING FIXTURE.
23. IGNITION HARNESS ASSEMBLY FIXTURES

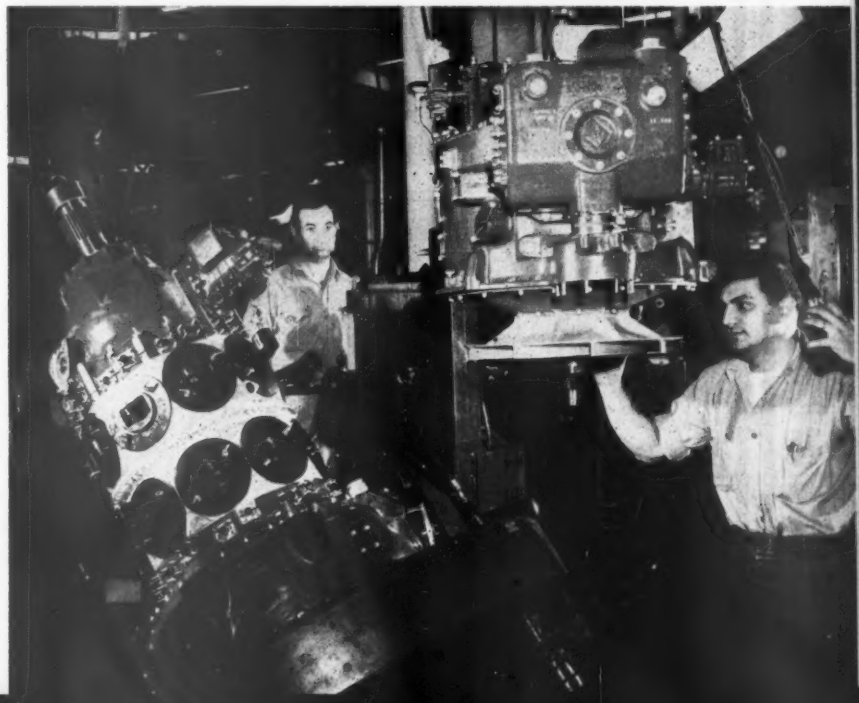
Simplified Layout of Turbo Compound Assembly Line

. . . Turbo Engine, from page 80

operation to the next. Virtually every mechanical assembly operation is done by automatic machinery, that does the specific job more accurately than skilled human hands and in some cases up to 500% faster.

Automatic assembly is facilitated by the engines being built up in three major sub-assemblies. Not until the front, power, and rear sections have been assembled together are the engines mounted on roller-type stands. The latter are pulled by floor-type conveyor through various final stations for installation of external parts, and for making necessary calibrations.

The assembly line is actually two lines—virtually identical in every respect. An engine is first assembled on the so-called Green Line, then flow checked, and run for 4½ hrs. The engine is then disassembled, its parts washed and inspected. Again, the engine is fully assembled—but this time on a Final Line. The completed engine is run for 3½ hrs in the test house and, twice proven, is ready for shipment.



Rear section of the Turbo Compound is being maneuvered into position for automatic assembly to the assembled power and front sections. These are shown in the stand at the left being inverted to assembly position.

Parts carriers — used on conveyors — are designed to both protect the parts or assemblies and insure a minimum of handling between stations.

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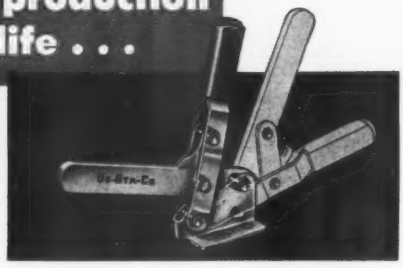

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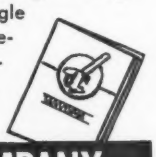

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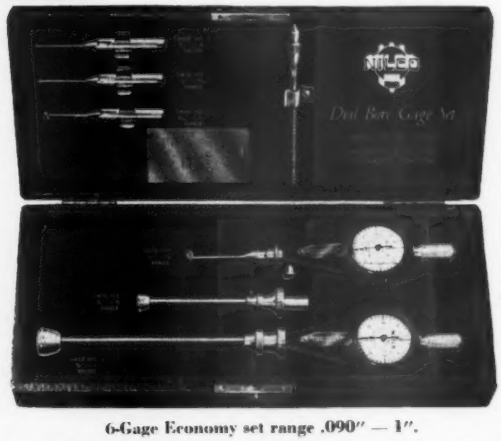

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CIRCLE INFORM-A-GRAM KEY NO. 172G

. . . Hardness Testing from page 83

tem, so far as Brinell machines are concerned. Calibrators for checking testing machines using test loads of 5 to 150 kilograms can also be furnished.

Some who specialize in building Brinell hardness testers will furnish either test blocks or so-called proving rings for checking. Steel test blocks provided are 1" x 1" 5/12", and have uniform hardness, which has been carefully calibrated to a standard Brinell hardness number. The test block can be easily placed in the hardness tester like a part or a specimen. The Brinell load is applied and diameter of the impression is compared with its calibrated standard. This provides a close check

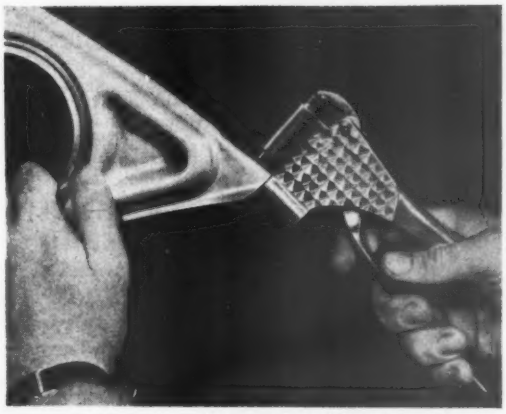

Photo courtesy Webster Instrument Company.

Fig. 2 The pliers-type portable hardness testers here seen in use are provided in different models, having the characteristics and limitations discussed in the text.

on accuracy of the machine. Adjustments can be made accordingly. Since all sides of the block may be used, enough surface is available to provide for many check tests.

The proving ring furnished by the firm in mind may be accompanied either by the manufacturer's certificate of calibration or by the U. S. Bureau of Standards' calibration chart. The deflection of the proving ring under load is measured by means of an accurately-machined micrometer screw, in conjunction with a large graduated micrometer dial. An electrically-operated vibrating reed is incorporated, by means of which readings can be taken very quickly and with great accuracy.

How Proving Ring Is Used

To check a hardness tester, the proving ring is placed on the flat anvil of the unit, and the adjusting screw of the hardness tester is raised until the Brinell ball fits in a small recess provided on the top of the proving ring. After a reading is taken to establish zero position of the proving ring (the reading of the micrometer dial at no-load) the micrometer dial is turned away from the vibrating reed by an amount just beyond the deflection of 3,000 kilograms, as given by the calibration chart. A load of 3,000 kilograms is then applied and held.

The amount of deflection for this load is measured by adjusting the micrometer screw until the reed just tops vibrating. If load on the machine is correct, the deflection will correspond to the calibrated readings of the ring for that load. If there is deviation, the machine should be adjusted to the proving-ring standard. Methods for making necessary adjustment on any given Brinell machine may always be obtained from the machine manufacturer.

Always take into consideration that no reading of a hardness testing machine can possibly be any more accurate than the accuracy of the indenter itself. When a testing machine making use of a diamond penetrator shows varied readings from the same material, or otherwise gives false readings, consider the possibility that the fault may lie in the penetrator rather than in the machine. Users of hardness testing machines incorporating diamond penetrators very often trade in their old penetrator for replacement to firms which specialize in the manufacture of such units. The price of a new penetrator is relatively modest, and is somewhat reduced by such a trade-in allowance.

Sphero-conical diamond "Brale" penetrators are often required for Rockwell testing hard steel. These must all be alike as touching angle and radius. The spherical tip employed must be truly tangent to the conical surface. These penetrators are ground precisely to shape under extremely high magnification.

Master Diamond Checking Sets

One interesting method of supplementing testing machine accuracy is use of a master diamond checking set. Such are provided by one leading builder of hardness testing machines, and consist of a master diamond penetrator and two test blocks, in a common kit. The diamond penetrator is designed to be used only for checking purpose, and is as nearly perfect as precision craftsmanship can provide. The relatively little wear it will receive (because it is used for testing purposes only) insures its remaining in perfect condition. When checking, the regular penetrator is removed from

. . . *Continued on page 175*

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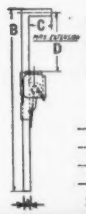

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Primary Stop.....$6.00 each

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Automatic Stop	A	B	C	D
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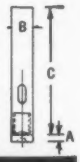
Specify right or left hand

Primary Stop	A	B	C
No. 1P	1/16"	3/8"	2 3/8"
No. 2P	3/32"	3/8"	2 3/8"
No. 3P	1/8"	3/8"	2 3/8"



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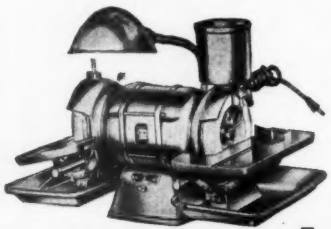

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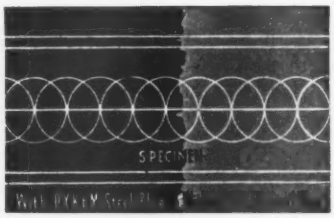

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. . . Hardness Testing, from page 173

the machine, and the master diamond is installed in its place. This provides for comparative checks between the master diamond penetrator and the penetrator regularly in use.

Some prefer the use of Vickers hardness testing machines. These instruments are available from different sources. The Vickers hardness tester is in a measure similar to Brinell machines, because it makes an indentation, after which the hardness number is determined from the ratio of the load in kilograms, to the surface area of the indentation in square millimeters. Indenters employed in the Vickers hardness tester are square-based diamond pyramids. The included angle between opposite faces on these indenters is 136 degrees.

Some claim greater accuracy for the Vickers method, because a more accurate reading can practically always be made of the diagonal of a square than of the diameter of a circle. The Vickers method of hardness testing is fairly fast, and can be used on metal which is quite thin. The method is versatile. Some say this is the only type of hardness test which can be used for all types of specimens, from the softest to the hardest. Some make such testing machines on which loads from 1 to 120 kilograms can be applied. Readings obtained are strictly proportional, and in one continuous scale.

The readings appear as actual figures on some of these machines, so that errors are avoided. The load is automatically applied, then automatically removed after a predetermined period. The work is often positioned on a sliding table, which, after the indentation is made, positions the piece precisely under the microscope ready for reading. There are knife edges in the eyepiece of the microscope, which provide maximum and minimum limits for production testing of similar pieces. A light load may be applied to check surface hardness when desired, and a heavier load may be used to test sub-surface conditions, all on one scale range.

Swinging Microscope Arrangement Optional

The sliding table arrangement mentioned is used when the microscope is in fixed position. However, if preferred, the microscope may be arranged so it can be swung over the work for reading. Since the indenter on this type of machine is a square-based pyramid, all impressions made by it are geometrically similar, irrespective of their size. Due to its enormous hardness, deformation of the diamond is practically nil. The microscope used in connection with this machine houses a lamp, condenser and vertical illuminator. Focusing of the knife edges to suit requirements is readily accomplished by rotating the eyepiece lens.

It is possible, through use of such a machine, to quite closely judge the useful depth of case-hardening. This is done by applying diminishing loads until the hardness figure remains steady. When this occurs, one knows the case is supporting the entire test load. On nitrided steel cases, hardness so determined is quite often accepted as a standard of the wearing quality of the case.

Special gear testing appliances are available

Photo courtesy Barber-Colman Company.

Fig. 3 An interesting type of portable hardness tester designed for quick checking of hardness on aluminum, aluminum alloys, soft metals and plastics. In using this instrument, it is only necessary to exert a slight pressure against it in order to drive the spring-loaded indenter into the material being tested.

for use in connection with these machines. They incorporate a special diamond and holder, together with a special fixture. By means of these, tests may be made on actual working faces of gear teeth without necessity for cutting and destroying a gear in the process. The diamond mounting is designed so that the diamond can reach in under the tooth adjacent to the one being tested. Another very useful attachment developed for this machine is employed for testing working faces of outer ball and roller races, or other places difficult of access. This attachment consists of an extended diamond unit for making the impression, and an extended objective unit for measuring it.

. . . Continued on page 176

. . . Hardness Testing, from page 175

Loads applied may be as small as one kilogram. Therefore, the machine may be used for testing very thin sheet materials. Another advantage is that as soon as any damage occurs to a diamond indenter being used, the fact becomes immediately and positively apparent, as soon as the impression is viewed under the microscope. Therefore, a warning is at hand which prevents use of a defective or damaged indenter. In cases where desired, this particular machine may be employed as an extremely accurate form of light-load Brinell tester. It may be supplied with one-millimeter and two-millimeter balls and ball holders for this purpose.

Low Load Vickers Units

Some Vickers type hardness testers have recently been developed covering a much lower loading range, extending from 300 grams to 10 kilograms. This instrument is very fast in operation. It can be used for testing immovable parts, because the indenter-measuring unit can be swung 180 degrees free of the column. Using such instruments it is possible to identify individual components, to test grinding, tempering, and many other types of testing not previously available because loads were too large.

One highly versatile and highly interesting hardness tester has been referred to as an all-purpose unit, because it provides for hardness tests in the Vickers, Brinell and Rockwell scales. In making either Vickers or Brinell-type tests with this machine, the specimen is placed in position and a handwheel is turned. At the top of the machine, facing the operator, there is a focusing screen, slightly over five inches in diameter. When the handwheel is turned as mentioned, the image of the test surface appears on this focusing screen.

After the indentation has been made, the indenter moves out of the impression, and the objective is shifted across, where it projects the impression with pre-set magnification on the focusing screen. It is there measured by means of a sliding rule. By exchange of objectives, a magnification of 140, 70 or 20 times can be provided on the screen, depending upon the size of the impression being made.

Where desired, a photographic dark-slide may be added which gives a permanent record of the focusing-screen image. If measuring scales with directly-marked hardness values are used, hardness numbers can be read from the focusing screen. Otherwise, such numbers must be obtained from charts, according to the diagonal or diameter measured of the Vickers or Brinell indentation, respectively.

Machine Also Incorporates Dial

In addition to the focusing screen mentioned, this hardness testing machine incorporates a dial for Rockwell readings. Change-over to Rockwell-type tests in very simple. After the Rockwell indenter is inserted, certain buttons are manipulated to prevent a return to the optical system. Means are provided for proceeding with the Rockwell test in much the same manner as on other Rockwell machines. The

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Rockwell hardness values are directly read from the dial indicator. Different types of fixtures may be obtained for use with these machines, for testing specific types of parts. This includes fixtures for testing drill points, gear tooth flanks, crankshafts, and various other special items. Compound tables are available for use when testing exceedingly small specimens.

Because a large amount of hardness testing must be done where only very shallow indentation is possible, special Rockwell machines, known as Rockwell Superficial testers, have been made available. These machines operate on precisely the same principle as standard Rockwell hardness testers. However, they operate with much lighter minor and major loads, and have a much more sensitive depth-measuring system. Whereas the standard Rockwell machine has a minor load of 10 kilograms, and selective major loads of 60, 100 and 150 kilograms, the Superficial Rockwell tester applies a minor load of only 3 kilograms, and the choice of major loads available include 15, 30 and 45 kilograms.

Depth of penetration is naturally in proportion. Where hardened tool steel is penetrated to a depth of around .0035″ on a standard Rockwell tester on the C-scale test, a Superficial tester on the same hardness of metal, using the customary 30-kilogram major load, would penetrate to only about .0010″ depth. One point of hardness for any test made on these machines corresponds to a difference in depth of penetration of only .001 of a millimeter, which is approximately .0004″.

Hardness readings are indicated directly on the dial gauge of such machines, just as with standard Rockwell hardness testers. Penetrator chucks may be used in connection with these units, which hold balls of ⅛″, ¼″ or ½″ diameter. These are used in testing dense non-metal materials too soft for testing with penetrators used for metal testing. A ⅛″ ball, however, is sometimes used for very soft metals, which tend to flow continuously under pressure. In such cases time of load application must be closely standardized.

Cleanliness Highly Important to Accuracy

When using a Superficial tester of this type, one must be particularly careful that no dust, scale or any particles are present on the under-surface of the specimen, or on the anvil. The very slightest sinking of the specimen under the testing load will definitely affect actual penetration as measured by the dial gauge. The finer the measurements with which one is dealing, the greater is the amount of care required. Several different models of Superficial Rockwell testers are available, with different values of vertical gaps. The smallest has a gap of about 3¼″, and the largest has a 16″ gap.

Every hardness test made on the Superficial hardness tester is based on an indentation depth of less than .005″. The indentation is nearly always less deep than a tenth of a millimeter. In hard steel, indentation depth is somewhere about .001″. When

. . . *Continued on page 178*

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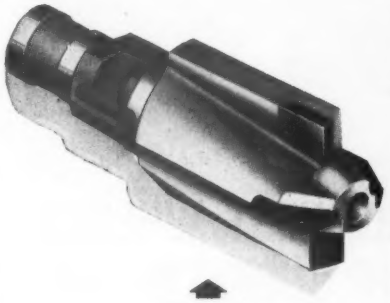

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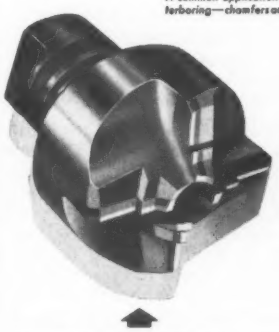
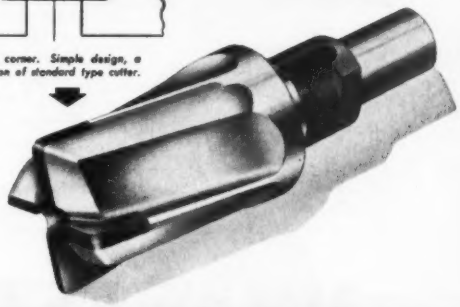


Used in machining aluminum alloy. Finishes five surfaces.

Radius corner. Simple design, a variation of standard type cutter.



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. . . Hardness Testing, from page 177

one bears in mind that any kind of penetration hardness test is definitely influenced by hardness of metal tested to a depth of at least ten times actual penetration depth, it is highly evident that thin metal, or thin hard cases, can be accurately measured only by very shallow indentation Thin sheet metal, thin strip, safety razor blades, cutters for electric shavers, tinplate and various other items are tested to advantage on this type of machine.

In various cases, need for testing non-ferrous alloys or metals is encountered. Different cases exist in which Brinelling machines (ordinarily provided in the standard load range) may be adapted for other desired Brinell loads, such as 500 or 1000 kilograms, and made available for use in Brinelling non-ferrous alloys and similar work.

There are also special portable hardness gauges which have been developed particularly for testing non-ferrous metals. One of these is a pliers-type instrument very extensively used. In factories where non-ferrous metals are fabricated, different problems arise at times in identifying heat treated materials from those which have not undergone heat treatment, also of recognizing parts which have been made from an improper alloy, or of sub-standard alloy. There is also the problem of differentiating between soft or work-hardened materials, etc. Materials falling within this scope include aluminum with its many alloys, copper, brass and other non-ferrous materials.

Cylindrical-Type Anvil Used

The pliers-type hardness gauge in mind incorporates an anvil of cylindrical design, which permits the instrument to be applied to almost any shape, regular, or irregular flat or round. Actual penetrator pressure is exerted by an incorporated load spring, and not by the particular degree of compression on the handles.

One model, particularly adapted for rapid determination of the acceptability of non-ferrous alloys, is widely used in the aircraft industry. It serves as a "go" or "no-go" gage for hardness. The readings obtained indicate whether the test piece is softer or harder than a pre-determined standard. The penetrator on this model possesses four teeth, each of different length. In testing, one impression only indicates heat treated or aged and strong aluminum alloy. Where two or more impressions are made, it indicates that the alloy has not been heat treated and aged, or that some substitution, such as common alloy, has been used by mistake.

This instrument leaves a permanent record of hardness in the form of an impression, which may be referred to as proof of test at any subsequent time. For speedy testing operations, a dial is included which is numbered from one to four. This corresponds to the major number of impressions possible, and instantaneously shows the number of impressions made, without actually inspecting the work. Where a series of tests are being made, speed of operation is more than doubled by use of this dial.

Another hardness tester of

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S11A Mid-West cool cutting wheels have been tested in the tool rooms of our customers all over the country. Results: operating costs were cut, while grinding efficiency was increased!
The reasons are simple. First, because of the quality of materials used. Made with a sharper, harder Aluminum Oxide grain in a glassy vitrified bond, Mid-West wheels offer top grinding results; yet you save on costs. Second, because each Mid-West cool cutting wheel is made for a specific tool room application. Using the right wheel for the right job not only increases grinding efficiency, but speeds up your production time. Your results are bound to be better! See for yourself . . . right in your own plant!
For complete information regarding Mid-West cool cutting grinding wheels, write, wire or phone today.
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Executive Offices: 510 So. Washington St., Owosso, Mich.
Factories: Owosso, Mich., Rochester, Pa.
MID-WEST ABRASIVES
CIRCLE INFORM-A-GRAM KEY NO. 178

this general type is for direct hardness readings on aluminum alloys. It provides a direct dial reading, showing variations in hardness ranging from that of 3S0 aluminum (soft) to slightly above bare 24ST aluminum alloy. The dial on this tester reads from one to twenty, which range corresponds to approximately E-5 to E-110 on the Rockwell scale. Readings obtained can be compared with other standard hardness scales if desired. This tester employs a cone as a penetrator. It provides greater ease of operation than the one formerly mentioned, due to a lighter spring load incorporated.

Unit for Use on Brass

Another model is somewhat more sensitive, and covers only a portion of the range above described. Designed mainly for use on brass, and similar metals, it has a dial graduated in hardness numbers from one to twenty, which numbers are readily correlated to standard hardness readings. The range covered is from annealed to full-hard brass.

Another highly competent portable hardness tester has specific reference to testing aluminum alloys, soft metals, and plastics. It may be used on fabricated parts and assemblies, as well as on raw stock. Operating experience is not essential for its use. One only exerts a slight pressure against the instrument in order to drive the spring-loaded indenter into material being tested. The tester can be used in any position, and in any space that will allow room for the hand of an operator.

A comparative hardness reading is obtained on a dial, where it is instantly indicated. This dial is conveniently divided into 100 graduations. Readings can be made without stooping, bending, or changing positions. Readings obtained may be converted to conventional Rockwell, Brinell and Vickers numbers. The tester employs a truncated-cone penetrator, which is ground from a steel round, previously hardened for a minimum of 66 Rockwell C. The tip or point of the impresser has been ground to a diameter of .00625″, and to an included angle of 24 degrees. This instrument has been found highly useful on non-ferrous alloys in many places.

Industrial News

Cliff G. Hartke, who for the past seven and a half years, has been purchasing agent of Teer Wickwire Company, manufacturers of automotive parts, has now joined the Lynair organization as Vice-President in charge of sales. Lynair, Inc., Jackson, Michigan, manufacture and distribute nationally, air and hydraulic cylinders for every requirement.

In addition to other representatives, they have recently appointed John C. Marshall and Associates of Cleveland and Frank A. Burnett Company of Cincinnati, as distributors in their respective areas.

Plans are now under way to add other items to further round out the Lynair line.

▲ Checking a roller to .000020″ on taper, diameter and out-of-round in reciprocating fixture with Par-Ac gage head.

◀ Centering a race within .000020″ before grinding. Indi-Ac electronic indicator shows runout as work rotates.

INDI-AC and PAR-AC GAGES Help the TIMKEN Company Make Bearings to .000075″ Maximum Runout

TIMKEN "Double Zero" tapered roller bearings are produced with a maximum runout of only .000075″ (*75 millionths*). This means that the factors producing runout must be held to .000025″ or less in races and rollers.

Working to such accuracy on a production basis calls for unusual methods—and for highly-sensitive gaging equipment that is rugged . . . dependable . . . fast-acting . . . and easy to set up and read. To meet these requirements, Timken Company engineers chose Indi-Ac and Par-Ac electronic gaging equipment.

Indi-Ac Electronic Indicators are used

- in centering races to .000020″ runout of the OD, for setting up to grind the ID concentric.
- in spot-checking and 100% final inspection of finished races, to see that the faces are parallel, the taper square with the faces, and the ID and OD concentric—all within .000025″.
- in final inspection of all assembled bearings, for flatness or parallelism and for runout—both within .000075″.

Par-Ac Production Gage heads and amplifiers are used

- at the machines in production inspection of rollers after grinding, for diameter, taper, and out-of-round within .000020″.
- in 100% final inspection of rollers as above—and for sorting the rollers by diameter in increments of .000020″.

Whether or not *your* tolerances are as close as these, Cleveland Electronic Gages can serve you well in the shop, toolroom or gage room. Write for bulletins on the Indi-Ac and Par-Ac —and on the Micro-Ac (reads .000001″ per division).

P.S. Timken's production methods on "Double Zero" bearings are described more fully in an article reprint. Want a copy?

Designed, developed and manufactured by

CLEVELAND INSTRUMENT CO.

Formerly Graham-Mintel Instrument Co.

739 CARNEGIE AVE. CLEVELAND 15, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 179

FREE MACHINING DIE STEEL

A patented free-machining high carbon-high chromium die steel of the D-2 cold work die steel type, has become available from Latrobe Steel Company, Latrobe, Pennsylvania.

Identified as "Olympic FM" it is Latrobe's answer to the machining difficulties that die makers have experienced using high carbon-high chromium die steels. In actual field tests, users have reported reductions in machining costs of up to 50% due to the fact that "Olympic FM" may be machined at speeds and feeds greatly in excess of those normally possible with standard D-2 steels. Further, it has been demonstrated that the new material will produce superior machined surfaces with a resultant reduction in finish grinding time.

According to Latrobe officials, the successful addition of the sulphides in a uniformly distributed manner is made possible by the "DESEGATIZED" process of tool steel manufacture announced in 1946. Laboratory tests conducted by Latrobe's metallurgists on "Olympic FM" specimens have shown that there is no appreciable change in the physical properties or heat treatment normally associated with cold work die steels of the D-2 high carbon-high chromium type. The new material is being manufactured under patent number 2204283.

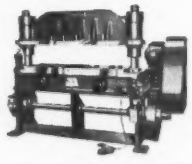
IF YOU USE A PRESS

We can demonstrate to you that a DIAMOND Multi-Max press will stamp, form or punch multiple series of holes cheaper than conventional punch presses. This patented Multi-Max press will enable you to use large or multiple dies on the extra long bed and ram area.

Forming a flaring on automobile fender skirts at Lindy's, Inc., Los Angeles, manufacturers of automobile accessories, using a DIAMOND Multi-Max punch press, model 3060 (30 tons rated capacity, 60" bed and ram length between posts). Multi-Max presses are made in 24", 36", 48", and 60" bed and ram lengths between posts, back geared, underneath double crank drive in 30 and 50 tons conservative rated capacities.

Multi-Max Punch Presses sell for about one fourth the cost of larger presses with same bed and ram area.

MULTIPLE USES
Conventional stampings using standard die sets.
Conventional press brake work.
Conventional power shearing.

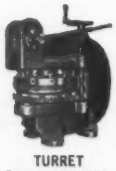


MULTI-MAX PUNCH PRESSES

O.B.I. PUNCH PRESSES

22 M MILLING MACHINES

POWER SQUARING SHEARS



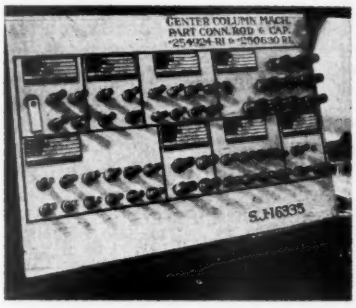
TURRET PUNCH PRESSES

HORN PRESSES

DIAMOND MACHINE TOOL CO.
PICO, CALIFORNIA

CIRCLE INFORM-A-GRAM KEY NO. 180

Special Tool Board



Saves Setup Time; Speeds Production

This special tool board, manufactured by Scully-Jones and Company of Chicago, Illinois, provides an improved, more efficient system for replacing tools on transfer-type and other multiple spindle machines. With a complete set of 56 newly sharpened drills and reamers ready to replace broken or worn tools instantly, setup time on a Footburt 6-station center column drill was reduced 40% and production was increased by 63 additional parts every eight-hour shift.

Each cutting tool is identified as to size, station, tool number, and adapter size. Also, an important part of this new replacement method is the standard presetting gages, which simplify and speed accurate setting of tools. Duplicating the holding method of the machine, they eliminate in-the-machine adjustments and machining of sample parts to check accuracy of depth settings.

. . . Lamination Dies, from page 57

punch. The latter lamination slides down an inclined plane and onto the two rods that form the stacking chute. The first-mentioned lamination is stacked in a chute which has a continuous curve. When it is fully loaded, the blanks on the end of the chute fall off onto an inclined plane, then onto two rods similar to those of the stacking chute. This E blank has been inverted in the process so that in both chutes the blanks are positioned in the same manner ready to be stacked in the formed channel boxes for assembly.

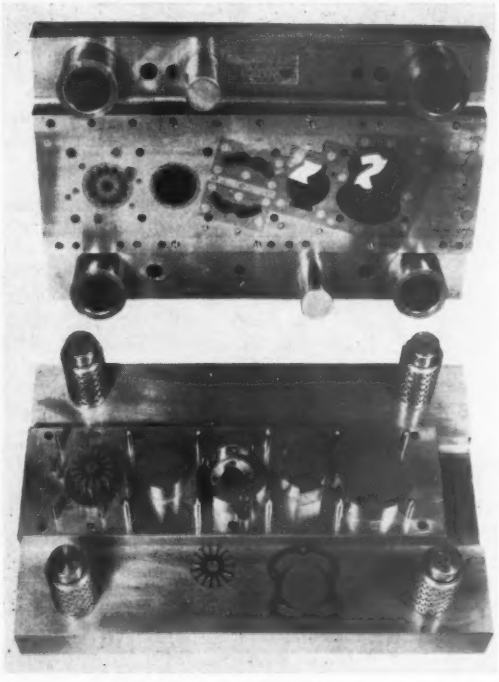


Fig. 6. A 5-station, sectional carbide progressive automatic die for producing rotor and stator laminations.

The press used in the manufacture of these laminations is a 60-ton Henry and Wright dieing machine. The scrap cutter and the left roll feed have been removed from the press. In as much as they were not being used because there is no scrap coming out of the die, this permitted the top stacking chute to be designed in a very simple manner.

Lempco ball bearing guide pin sets are used throughout in the building of these fine dies. The free and easy movement that these ball bearing guide posts offer, contributes largely to to the success of proper punch and die alignment by the diemaker.

The dies in the accompanying illustrations, Figures 2, 3, 4, 5 and 6, were made by the Cleveland Form Tool and Die Company.

IMMEDIATE DELIVERY
on SOCKET HEAD CAP SCREWS

. . . Up to 12" Long!
on ½", ⅝" and ¾" Dia. Screws
and No Special "Set-Up Charges"

WHY HOLD UP YOUR WORK . . . for long deliveries on those so-called "special length" screws? You can get really fast service on high-quality Socket Head Cap Screws, Stripper Bolts and Dowel Pins . . . AND you don't have to pay special set-up charges either! D-M-E's large volume turn-over enables you to get in on the savings!

SO . . . Why Wait? . . . When you can get the Finest Quality, in Less Time, and at Less Cost to you!

. . . for 1 or 100!

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HOW TO WIN ARGUMENTS

on Surface Roughness!

FREE BULLETIN LT85 tells–

★ Why time is wasted by arguments about the roughness of parts produced.
★ How to end such arguments FOR SURE.
★ How shop men, engineers and management all gain when such arguments are settled by the Profilometer.

WRITE TODAY for your copy!

Profilometer is a registered trade name.

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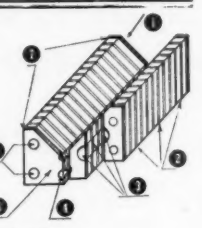
MAGNETIC CHUCK

PARALLELS and V-BLOCKS

1. "V" centered and ground parallel to base.
2. Spring-temper, phosphorous bronze, non-magnetic laminations.
3. Positive mechanical lock, non-shift laminations. Patent pending.
4. Dowels welded to end plates.
5. End plates ground square.
6. Five hard temper, silicon bronze dowels.
7. ⅛" end laminations welded and ground square.



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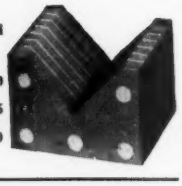
PRECISION EXACTNESS & HIGHEST QUALITY
GUARANTEED WORKMANSHIP & MATERIAL

No.	Size	Matched Pair
IP2	1x2x2	$16.50
IP3	1x2x3	19.50
IP4	1x2x4	22.50

Price includes HARDWOOD BOX

No.	Size	Matched Pair
IV2	1¾x2½x2	$22.50
IV3	1¾x2½x3	33.75
IV4	1¾x2½x4	45.00



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World's foremost producer of small die castings
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Officers Elected at PMI Annual Meeting

Samuel P. Hull, Vice President of the Worchester Stamped Metal Company of Worchester, Massachusetts was elected President of the Pressed Metal Institute at its 10th Anniversary Meeting in Philadelphia October 7th through October 10th.

Elected Vice President of the Institute was James M. Leake, President of The Leake Stamping Company, Monroe, Michigan while Hunter Morrison, Jr., Vice President of Morrison Products, Inc., Cleveland, Ohio was elected Secretary-Treasurer for his third consecutive term.

Directors of the Institute elected during the convention which was attended by representatives from stamping companies from coast to coast and Canada:

H. E. Berry, Thomas Smith Company, Worcester, Mass; R. W. Blackman, Blackman Stamping & Mfg. Co., Los Angeles, Calif.; L. E. Dail, Dail Steel Products Company, Lansing, Mich.; W. R. Fischer, Peters Stamping Company, Perrysburg, Ohio; K. A. Honroth, Freeway Washer & Stamping Co., Cleveland, Ohio; H. P. Hopp, H. K. Metal Craft Mfg. Co., New York, N. Y.; Ray Howland, Eastern Tool & Stamping Co., Saugus, Mass.; E. A. Irwin, E. W. Bliss Company, Canton, Ohio; Bruce Krasberg, R. Krasberg & Sons Mfg. Co., Chicago, Ill.; W. K. Lomason, Douglas & Lomason Company, Detroit, Mich.; Sam Morrison, Morrison Steel Products, Inc., Buffalo, N. Y.; E. T. Nolan, Advance Stamping Co., Detroit, Mich.; W. J. Primrose, Jr., The Dickey-Grabler Company, Cleveland, Ohio; C. Glenwood Rose, Judson & Rose, Inc., Philadelphia, Pa.; George N. Schramm, United States Steel Corp., Pittsburgh, Pa.; C. E. Stryker, Maysteel Products, Inc., Milwaukee, Wis.; Norman R. Thal, Inshield Die & Stamping Co., Toledo, Ohio; and Melvin Verson, Verson Allsteel Press Company, Chicago, Ill.

Frank Humberger, President of Technical Metal Processing, Inc. of Cleveland, Ohio was elected Chairman of PMI's Associate Members, and John F. Lott, Vice President of Federated Steel Corporation, Pittsburgh, Pennsylvania was elected Vice Chairman.

Highlights of the convention included a panel discussion on "Wage Incentives" moderated by Orrin B. Werntz (Managing Director of PMI) and featuring C. W. Cederberg, Treasurer of Larson Tool & Stamping Company, Attleboro, Massachusetts; J. W. Gulliksen, General Superintendent of Worcester Pressed Steel Company, Worcester, Massachusetts; W. K. Lomason, President of Douglas & Lomason Company, Detroit, Michigan; and P. C. Wood, Assistant to the Vice President in Charge of Manufacturing of the Acklin Stamping Company, Toledo, Ohio.

The first trade association for the metal stamping industry was formed during World War I in 1918; and the successor, Pressed Metal Institute was incorporated as a non-profit organization under the laws of the State of Ohio in 1943; and now includes in its international membership companies from coast-to-coast and also England and Canada. The industry is well known for its engineering ability and volume production of pressed, stamped and drawn metal parts.

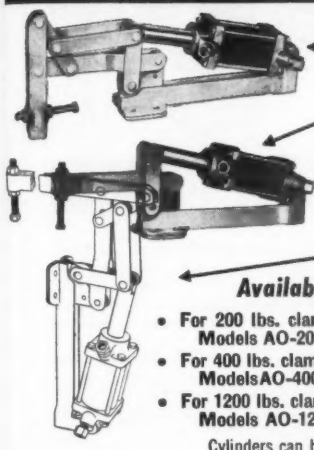
Certificates of Merit, which are PMI's highest honor, were presented during the banquet to retiring President, Wallace F. Ardussi, President of Variety Machine & Stamping Company, Cleveland, Ohio for his work in promoting and advancing the Pressed Metal Institute; and C. O. Rainey, Secretary-Treasurer of Morrison Steel Products, Inc., Buffalo, New York for his services in the preparation, presentation and distribution of the industry's first Cost Control Manual and for his services as Chairman of PMI's Committee on Statistics.

At this Tenth Anniversary Meeting, announcement was made of the appointment of R. W. Breckenridge as Technical Director to head PMI's new technical and engineering department.

Headquarters of the Pressed Metal Institute are at 2860 East 130th Street, Cleveland, Ohio; and Managing Director of the Institute is Orrin B. Werntz, and E. M. Ross is Assistant Manager.

HAVE YOU HEARD ABOUT AIR-OPERATED TOGGLE CLAMPS

to step up your clamping operations?



Knu-Vise (AODT-400)
Double-toggle Clamp to clamp "around the corner"

Knu-Vise (AO-400)
Toggle Clamp for conventional clamping.

In cases where the cylinder interferes with conventional clamping, the Double-Toggle Clamp shown at the top serves such difficult mounting situations as illustrated in the superimposed line drawing.

Available in 3 series

- For 200 lbs. clamping force Models AO-200 and AODT-200
- For 400 lbs. clamping force Models AO-400 and AODT-400 (illustrated)
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Cylinders can be easily rotated to suit air supply from either left or right side.

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FOR HOLES FROM 1/16" UPWARD
17 DIFFERENT SIZES

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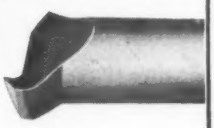
Cutting Edges are lapped for better "Bores" and faster Feeds.

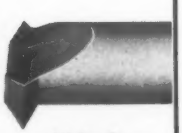


✓ FACING TOOL

- CONSTANT CLEARANCE
- CONSTANT SHAPE OF CROSS SECTION
- EASY RESHARPENING
- CONVENIENT TO USE
- LONG LIFE

✓ INTERNAL THREADING TOOL

- CONSTANT SHAPE AND CLEARANCE
- EASY RESHARPENING
- CONVENIENT TO USE - LONG LIFE



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D-M-E TAPERED MILLING CUTTERS

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WITHOUT TILTING THE MACHINE HEAD OR THE WORK PIECE!

You can take Faster, Smoother cuts, WITHOUT CHATTER. Made from the finest High Speed Steel to prevent breakage and costly "down time". You'll save Time and Money with D-M-E Tapered Milling Cutters!

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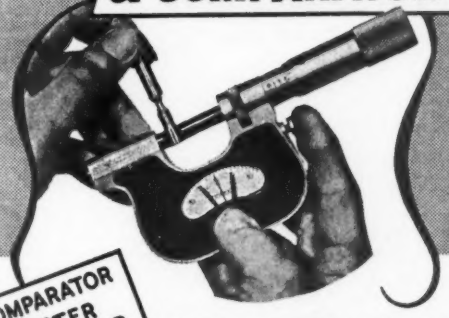
ELIMINATE* HUMAN ERRORS WITH INDICATING MICROMETER & COMPARATOR



COMPARATOR MASTER MICROMETER GO-NO GO GAGE 1" RANGE IN 10000ths - NO GAGE BLOCKS NEEDED

* HUMAN ERRORS THROUGH DIFFERENCES OF "FEEL" ELIMINATED. WILL DETECT OUT-OF-ROUNDNESS, OVALNESS AND TAPER.

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GET
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OLIVER
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PLANTS of ALL SIZES
REPORT SAVINGS up to 60%

Oliver Die Making Machines are so simple to operate that skilled labor is not needed. They increase toolroom efficiency . . . cut costs . . . assure precision perfection. Four decades of experience and more than 10,000 installations throughout the world vouch for the superiority and long life of Oliver Die Making Machines.

Start saving money now. Do sawing, filing and lapping the proved way . . . the Oliver way.

OLIVER DIE MAKERS
Available in 5 Models

The Bench Model S-1 (illustrated) is a single speed die maker for use on tool steel up to 1" thick.

The Heavy Duty Model (illustrated) has 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

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MACHINE TOOLS by OLIVER include:
AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS
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Since considerable savings are often possible, if you let our engineering staff assist you, we will be glad to cooperate. There is no obligation. Simply explain problem and send sample or drawing of work.

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CAST IRON KNOBS

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REID TOOL SUPPLY CO. Muskegon Heights, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 184D

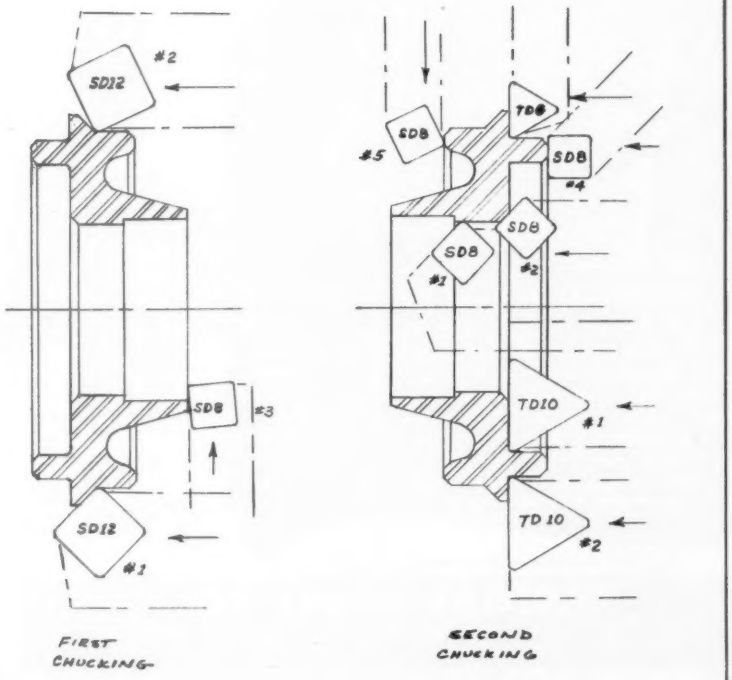
. . . Automation, from page 96

part by using Kendex buttons. This figure includes pro-rating the cost of holders over 100 inserts, a conservative estimate of the number of inserts used up during the life of a tool holder. Of greater importance, however, on this job is the fact that production has been increased from 200 parts per shift to 400 parts per shift by the eliminating of delay factors so critical to automatic tooling, i.e., downtime for tool changes and the variables encountered when using reground tools.

Kendex buttons are not the answer to every single point machining problem, but they do fill a critical gap in tooling for automation on multiple-spindle machines. Their outstanding performance to date indicates that button tools will play an important part in this type of production tooling.

Fig. 5. Automatic cycling on multiple-spindle machines necessitates uniform, long tool life and ability to make tool changes rapidly.

Fig. 6. Tool plan for setup shown in Figure 5, specifies the Kendex tools required, and the sequence in which they function.



MANAGEMENT WITH AUTOMATIC PRODUCTION*

by Charles E. Knight
Plant Eng'r, Plastics Div'n
MONSANTO CHEMICAL COMPANY
Springfield, Massachusetts

INCREASED EMPHASIS on the advent of the automatic factory and the pace of recent technological developments invite serious consideration of changes in management organization required for this new industrial environment.

For instance, an automatic factory designed to produce (glass) tumblers of various types will be a custom-built facility, complex in itself internally, but a simple functional unit over-all. Such a unit envisions the need of a mechanical brain and a control computer to aid management. Shape, size, formulation, color, product rate are programmed into the control computer — which, through a system of subordinate computers, feedback and servo mechanisms, executes the orders given.

Human effort consists of policy making, providing the control and forecast computers with information, maintaining the equipment, procuring raw materials, and marketing finished products. In these provinces, however, man's skill must be considerably refined in order to keep pace with the dynamic production organism at his command.

In this factory, it will be the job of management to combine the classical "5 m's"—money, materials, machines, men, and markets—for the profitable production and distribution of a commodity. Management will evolve from a change in emphasis on the phases of its present responsibilities.

Policy making—A longer view will be taken at all levels. Ten or fifteen year programs for profitable use of invested capital will be required at lower levels. Markets should be so developed as to minimize seasonal changes, short custom runs. Larger amounts of capital will be ventured on introduction of a new product line.

Advance Planning—This will be more complex, take more factors into consideration. A forecasting computer—acting on information inputs concerning markets, raw materials, personnel, equipment and maintenance costs, and other known variables, will help predict the company's response to a contemplated course of action.

Equipment — Production line units will usually be designed with the end product in mind, will be integrated with each other. Production of a family of similar commodities will be envisioned. Subject to computer observational control, the line will be capable of considerable product form change without re-

*From a paper presented before the 1953 Annual Meeting of the American Society of Mechanical Engineers and reprinted by courtesy of the ASME.

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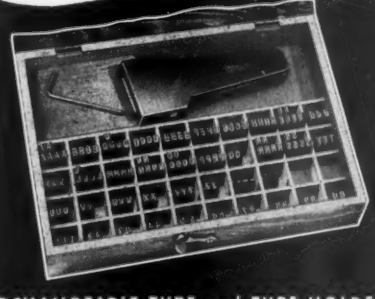

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tooling. With automatic material handling and on in-process inventory, buildings should become smaller, more compact, more functional.

Personnel—Selection and development will assume tremendous importance. More technical background will be required at all levels. There will be fewer but more highly skilled workers per unit output. Training will be longer, more costly; the penalty for failure higher. In this environment, employee attitudes will change, requiring more attention to incentives. Teamwork will be the watchword.

Production — Strictly production personnel will be limited to computer technicians programming the line. It will be hard to separate maintenance and material handling from the production activity as we think of it today.

Maintenance — This will be mostly preventive (to minimize costly unexpected breakdowns), will require more highly trained versatile engineers and craftsmen. Ease of maintenance, standardization, instrumented troubleshooting will be designed and built into machines.

Controls—The computers and business machines which control and monitor the production organism can be made to turn out continuous information on quality, costs, general unit performance. More nearly accurate standards and faster mechanized reporting will be the case.

Communications — Two-way radio, television, public address systems will move vital information faster. There may be fewer people, but they must be more completely, more quickly informed.

* * *

The Production Manager will find his problems mostly of an engineering nature. In the automatic factory, it will be virtually impossible to separate the functions of production, maintenance, and material handling. Except for programming the line, production and material handling will consist of maintaining smooth operation of a dynamic but mechanical complex.

Plant design and construction may be too much a part of production to be separated from it. Ease of maintenance must be engineered into new construction.

The Production Manager will probably be a systems engineer, one of a new breed of management personnel. He will be well-versed in the fields of feedback analysis systems, functionally related processes, computer control; but, he must be more than a theorist. He should be able to mingle as freely with the technician in the factory as with the scientists, and understand how best to utilize special skills.

While there will be fewer workers per unit output, they will be more highly skilled and require more formal training before going on the job. They will be curious, imaginative, will require more general information on every phase of operations.

Selection and training will be big jobs. For maintenance and service workers, extended apprenticeship training will be required. It will be imperative to screen prospective employees with good test batteries slanted at your own operations.

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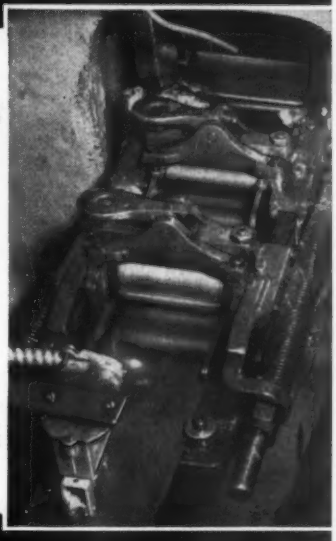

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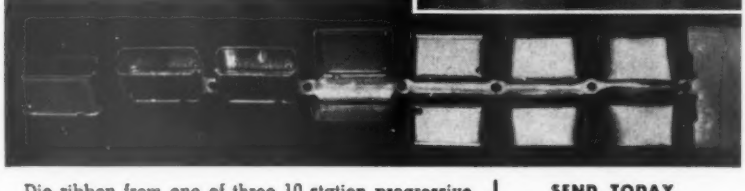

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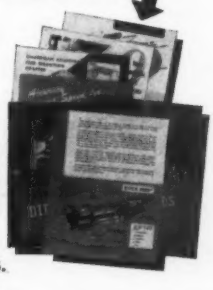

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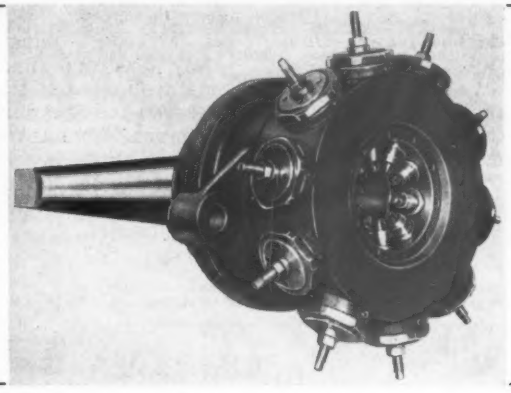
VERSATILE TOOL FOR MULTIPLE MILLING

A great variety of ordinarily difficult or involved machining operations can be performed with considerable simplicity and expediency with the multiple cutter tool shown in Figure 1.

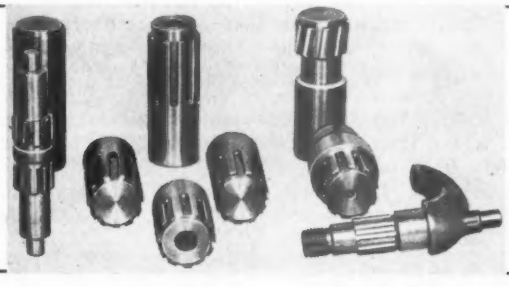
It performs the job of milling multiple splines, grooves or slots, straight or spiral, in propellor shafts, drive shafts, and such a variety of other parts as is represented in Figure 2.



Manufactured by Earle G. Boyer of Philadelphia, the compact and sturdy "Universal Cost-cutter", as it is termed, can be used with and powered by such readily accessible shop machines as drill presses, engine or turret lathes, etc.

The head is equally applicable to the milling of squares or hexagon on the ends of machined parts. In the milling of slots in the periphery of spanner nuts, a dozen nuts may be loaded or stacked on a work-holding arbor for taking all the cuts in a single operation.

Another feature of the "Universal" is that in addition to its taper shank drive it is available with a hollow spindle drive which permits the grooving of long workpieces.



Various types or shapes of splines or grooves are cut simply by changing cutting tools. External provision is made for adjusting the cutters to a micrometer setting while the head is operating.

Because it is designed for operation in either forward or reverse, longitudinal or vertical, or at any angle in between, the cuts can be made straight or spiral in either direction from a maximum to minimum pitch. Examples of this versatility is the milling of straight or spiral flutes in taps, reamers, counterbores, spotfacers, and all types of special cutting tools.

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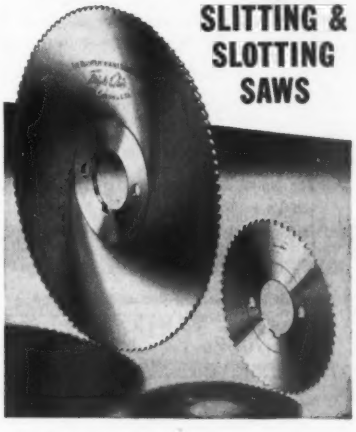

The Motch & Merryweather Triple-Chip Method clears the way to faster results in milling operations. Alternately ground paired high and low blade teeth form curling, self-clearing chips which relieve stresses and minimize breakage. Saws produce more work and more accurate work and "live longer".

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Pressed Metal Institute Announces Fifth Annual Technical Meeting

The 1954 Annual Spring Technical Meeting of the Pressed Metal Institute will take place at the Hotel Carter in Cleveland, Ohio, March 17th through March 19th.

James L. Chase of the E. W. Bliss Company, Detroit, Machigan is General Program Chairman for this meeting. His committee comprises: Frank Humberger of Technical Metal Processing, Inc., Cleveland, Ohio; Frank Schmidt of Jackson Metal Products Company, Jackson, Michigan; and Philip C. Wood of The Acklin Stamping Company, Toledo, Ohio.

Subjects to be discussed during the technical sessions of March 18th and 19th include: "In Process Material Handling", "Resistance Welding" and "Progress and Possibilities of the Use of Plastic Dies in the Stamping Industry." Those in attendance will also have an opportunity to visit three prominent plants in the Cleveland area.

Safety in a Stamping Plant will be the theme of the first day's meeting. The 1953 Technical Meeting inaugurated the safety program and its success has encouraged PMI's Technical Research and Standards Committee to annually expand the meeting to a three-day session with the first day dedicated to accident reduction in the metal stamping industry.

Grinding Welds with Flexible Shaft Machines

Flexible shaft machines are being used more and more by manufacturers to grind welds. Portable machines are more expensive than bench grinders, but many parts are so large or bulky that a portable tool is necessary to finish off the welds. There are several good reasons for the wide use of flexible shaft machines for this type of job. First, to grind off a weld, pressure must be applied by the operator on the grinding wheel. Therefore, to prevent the wheel from slowing down, a fairly high horsepower motor must be used. If a direct-driven electric machine or any air-operated machine is used, in order to obtain the necessary horsepower, a very heavy tool must be used. This is not only difficult for the operator to handle, but it is also very fatiguing.

With a flexible shaft, the operator can obtain a great deal of power with a light tool.

Another factor that has made flexible shaft machines so popular for grinding welds is their low maintenance cost. Many machines have been in operation every day for 10 years with practically no maintenance cost. All that is necessary is to grease the

. . . *Continued on page 198*

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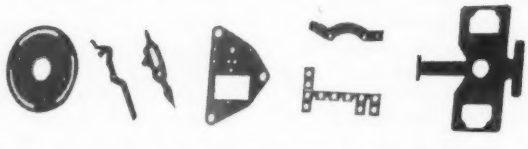

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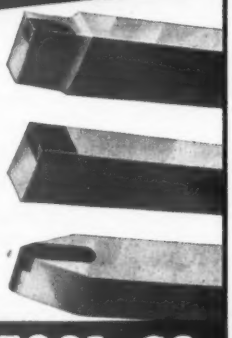

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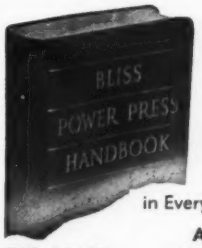

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EMPLOYEE SUGGESTIONS CLICK AT TEMCO

Broaches from Scrapped Reamers

TEMCO Aircraft Corporation has found a new use and a new life for scrapped reamers with chipped or worn flutes.

These relatively expensive tools are reworked in a matter of hours into draw broaches. Thus TEMCO gets a maximum return for its original reamer investment and avoids the expense and wait normally encountered in broach buying.

Reamers and broaches both are used for close tolerance hole-sizing and finishing. They come into action after holes have been drilled or bored. Reamers, which cut and burnish with a rotary motion, are used on blind holes. Broaches are simply pulled through open holes to perform the same function.

Both are custom-made tools which are turned out on elaborate, single-purpose machines by specialized tool manufacturers. Users of broaches normally find it impractical, or impossible, to manufacture the tools with conventional factory equipment.

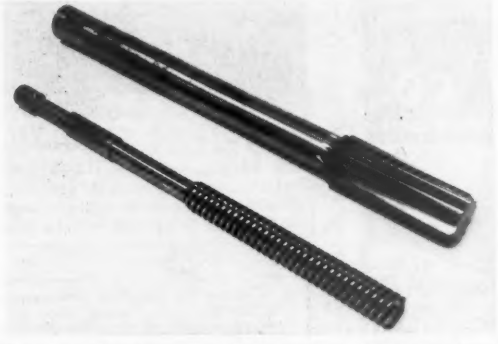

Fig. 1. Transformation from reamer (top) to broach (bottom) requires just four hours at TEMCO Aircraft Corporation. Using scrapped reamers as metal stock, and Cylindrical grinders for fabrication, TEMCO has manufactured broaches ranging in size from ⅜ to 1¼ - inch.

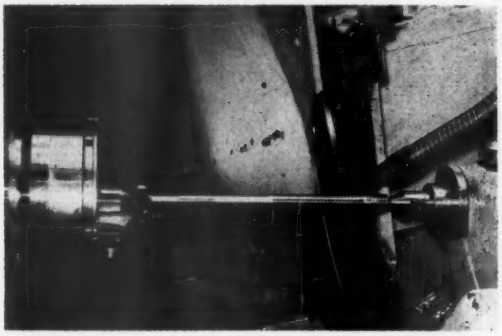

Fig. 2. Scrapped Reamer is shown here on a TEMCO-Ex-Cell-O thread grinder. After four leads (or spirals) are cut and the tool is tapered to .001-per-inch, it is ready for use as a broach. Thread-grinder gives each lead a secondary land of 45 degrees and a primary land of seven degrees.

At TEMCO, two supervisors found an answer to this problem.

P. F. Young, machine shop superintendent, proposed making broaches with spiral threads instead of conventional circular threads. This change made specialized broach-making equipment unnecessary. Thread-grinding could be done on the company's J. & L. and Ex-Cell-O thread grinders.

Hiram W. Nowell, assistant foreman under Young, proposed using scrapped reamers as stock for TEMCO-manufactured broaches. This practice enabled TEMCO to make broaches at practically no expense.

Accustomed to waiting weeks, or months, for broaches to be custom-made to production specifications TEMCO now can put a new broach into service within four hours after its specifications are established. Two major steps are involved in producing broaches from cast-off reamers.

The reamer first is ground to desired size on a cylindrical grinder. Reamer diameter must be sufficiently larger than the desired broach diameter to allow for grinding. For example, Nowell selects a ⅞-inch or ¾-inch reamer to remake into a ½-inch broach.

On the cylindrical grinder, the reamer shank also is formed to fit the adapter on a broaching machine.

Next step is thread-grinding. Nowell's broaches have four leads (or spirals) with a pitch of two threads per inch. Each lead has a 45-degree secondary land to provide shaving clearance, and a 7-degree primary land, which is the cutting edge.

Leads on TEMCO-manufactured broaches are similar to a Buttress thread used on firearms, where pressure (recoil) comes from only one direction. Broach pulling action, likewise,

. . . *Continued on page 196*

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AUTOMATIC FILING
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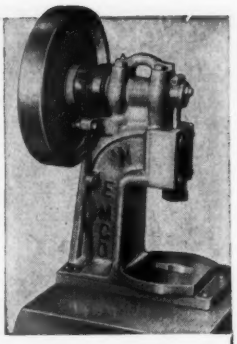

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New Pressure Testing Machine Detects and Locates Leaks

A new line of vertical pressure testing machines that detect and locate leaks in castings as well as brazed, welded and soldered assemblies has recently been announced. These air-operated, electrically controlled machines subject parts to a 10-second automatic check in which the part or a specified area in the part is charged with a given volume of air. Loss of air pressure, indicating a leak or flaw in the part or various areas in the part is indicated by signal lights through an extremely sensitive measuring system.

Photo courtesy Hautau Engineering Company

Machine Features

These pressure testing machines are designed to provide maximum production speed with minimum loading time. The machine illustrated detects and locates leaks in a rifle grenade assembly fabricated by soldering together several spun copper parts. Four test stations are provided in the machine to enable the testing of four grenades at a time. Two stations are unloaded and loaded while two stations are making the 10-second air check.

Unit mounting of the measuring system components for each station on individual panels at the rear of the machine plus separate air clamping cylinders for each station permit the machine to continue to function regardless of the operating condition of an individual station.

Pushbutton controls are located so that minimum hand motion is required to load the machine and control the test cycle. Three signal lights indicating the result of the pressure test are located under each station.

Two of the signal lights locate leaks in the grenade soldered joints by indicating whether the leak is between chambers or to the atmosphere. The other indicates O. K. parts.

Loading of parts in individual test stations is facilitated by fluorescent lighting of a bright yellow painted recess.

Machine Operation

To operate the machine, the two left hand stations are loaded by placing the grenades in rubber-faced spring clamp jaws. The test cycle for these stations is initiated by pressing two interlocked cycle start buttons at the left and right hand sides of the control panel.

. . . *Continued on page 198*

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CIRCLE INFORM-A-GRAM KEY NO. 195C

. . . Suggestions, from page 192.

exerts pressure in only one direction.

The salvaged reamer is ground to a .001-per-inch taper except for the last one inch of its length. This is left untapered to give the finished broach its burnishing action which, in turn, gives hole sides a mirror finish. Tapering is done on the thread-grinder.

TEMCO's broach developers wondered at first if their broaches' spiral threads would cause the tools to twist when pulled on the 50-horsepower broaching machines. No twisting occurred, however, instead, the spiral cutting edges give a desirable shearing effect.

Drilling on an Angle

Drill bits like to wander when used at an angle, or on a contoured surface.

Inaccurate holes often result, and quality depends solely on experience of the driller.

This problem recently was solved at TEMCO Aircraft Corporation. The solution is a ball and socket-equipped drill block that is called "universal" by the Dallas, Texas, firm because it fits any surface contour and secures the bit at any desired drilling angle.

B. C. Ballard, of 1630 Ramsey Ave., Dallas, designed the universal drill block, two of which now are stocked in TEMCO's main tool crib. Ballard, a jig-builder, knew first-hand how awkward it is to use a flat, or conventional, drill block on a contoured jig or die surface.

His universal block is conventional in size. It measures 3½ by 6½ inches, and the tool steel from which it is made is 1⅛-inch thick.

Like any drill block, it has a hole in its center for the slipfit drill bushing that secures and guides the drill. But here, the universal block's resemblance to conventional block ends.

The hole in Ballard's block, bored for a one-inch bushing, is centered in a ball which, in turn, is enclosed in a socket. Radius of both ball and socket is 2¼ inches.

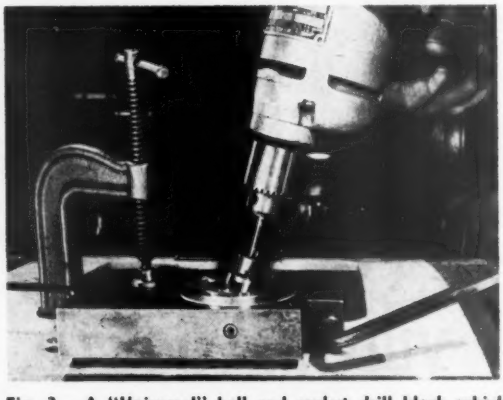

Fig. 3. A "Universal" ball and socket drill block which fits any surface contour and secures the bit at any desired drilling angle.

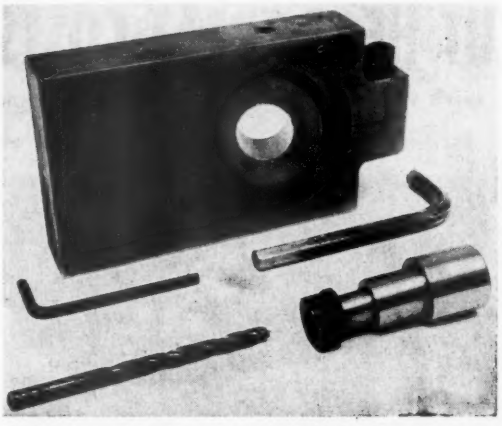

Fig. 4. The illustration shows Ballard's block with a hole, bored for a one inch bushing, centered in a ball which in turn, is enclosed in a socket. The radius of both ball and socket is 2¼ inches.

Since each has the same radius, the ball would be immovable, if Ballard hadn't made other provisions. He allowed the ball freedom to rotate within the socket by cutting the block through, from one end to its juncture with the socket.

This cut widens the socket enclosure fractionally, and the socket itself—made of two separate, semicircular pieces, held in the block by set screws—widens just enough to give the enclosed ball sufficient clearance to move.

Thus, the ball, and the bushing hole within it, can be tilted to any reasonable degree for angle drilling. Once at the proper tilt, the ball can be secured in that position. This is done by tightening a cap lock screw which closes the cut in the block which, in turn, tightens the socket around the ball.

In cases where angles must be exact, to fractions of degrees, the bushing hole angle may be pre-set by setting on a sine plate.

Thus the ball-and-socket bushing makes angle drilling fast and easy work, even for inexperienced jig or tool-makers.

Other provisions in the universal block make drilling on contour surfaces just as easy.

Socket-head jack screws are threaded into the drill block at five different points—including the block's four corners. These screws can be run out of the base of the block so that they extend like legs. On an irregular surface, the screws' exposed length is adjusted so they make the block a solid platform, then the block is secured to the surface with a C-clamp.

TEMCO uses the universal block principally for enlarging holes, but the device is equally well-suited for locating holes. It can be used with a hand operated drill, or with a drill press.

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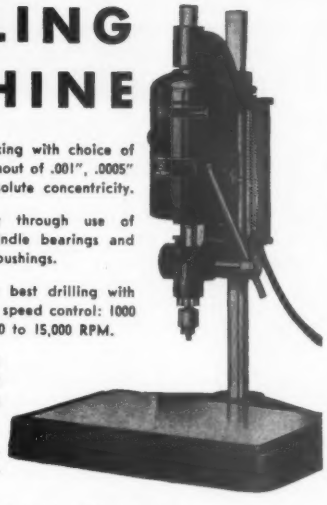

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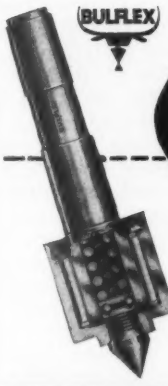

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. . . Pressure Testing, from page 194

This causes air cylinders above the station to lower a clamping head, thus sealing both ends of the parts for the test operation. O-ring seals and rubber face seals in the clamping adapters seal both ends of the grenade as well as each end of a square tube in the assembly.

Build-up of pressure in the clamping cylinder when the grenade is securely clamped causes the test cycle to start automatically. Then a chamber in the grenade is charged with a given volume of air. Any leakage of air is indicated by one of the signal lights, thus showing defective parts and the joint that is improperly soldered.

While the left hand cylinder test cycles are taking place, the right hand stations are unloaded and loaded. Their test cycle is initiated by pressing two interlocked buttons under the left hand cycle start buttons. Emergency stop buttons are provided under the cycle stop buttons.

Operating condition of any test station is quickly checked by clamping a dummy part in the station and reading any air loss in the circuit on precision air gages on the front of the machine above each station.

Machine Specifications

The pressure testing machine is 6 ½-ft. high, 38-in. wide and 26-in. deep. It is of welded steel construction and weighs about 800 pounds. Air test controls are in a panel at the rear of the machine. Electrical controls are in a side panel. Air test, electrical and clamping station controls are all accessible through hinged covers.

The machine operates from an 80 psi air source and a 110-volt line. Precision pressure gages in the cycle control panel permit individual control of each station.

Complete cycle time to load, check and unload two parts is 17 seconds.

. . . Grinding Welds, from page 190

flexible shaft occasionally.

Flexible shafts have a small diameter at the end of the tool compared to air or electric tools. Because of this, they can be maneuvered in spots that would be impossible for other types of machines, for example, the inside of castings and pipes.

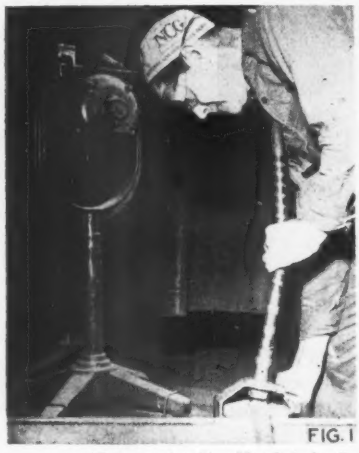

FIG. 1

Photos courtesy Stow Manufacturing Co.

The following case histories are typical of the application of flexible shaft tools.

Grinding Welds on Large Frames was a problem for the Governair Corp., of Oklahoma City, Okla. At first they used a heavy portable electric disc sander with abrasive discs. This was fatiguing and difficult to maneuver in tight spots like the one shown in Figure 1. Then they purchased a ½ hp flexible shaft machine and as a result have cut operation costs considerably and prevented fatigue. They use a Macklin's A16R8B5 grinding wheel running at 3450 R. P. M. There have been no maintenance problems during the 7 years this machine has been on the job.

FIG. 2

Doubled Output of Freon Receivers with Flexible Shaft Machines. Brazing the seam of a freon receiver at the Governair

. . . Continued on page 202

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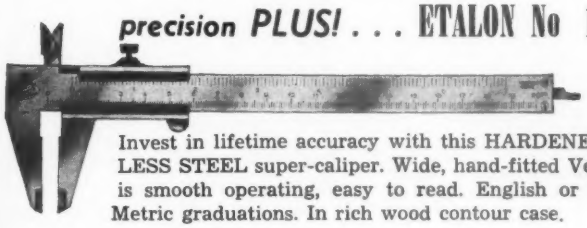

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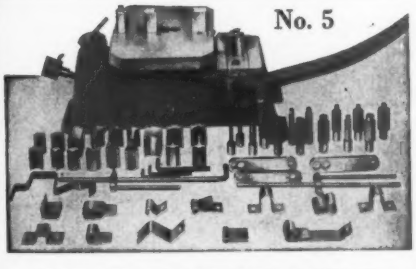

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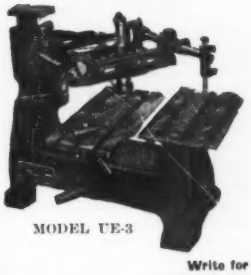

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CIRCLE INFORM-A-GRAM KEY NO. 200A

JEWELERS' LATHE USED TO BUILD MICROSCOPIC PRESSURE PROBE

A tiny, total pressure probe, built on a Levin jewelers' type lathe, from .072 and .018 tubing, to measure air flow through turbo-machinery, has been devised by AiResearch Manufacturing Company of Los Angeles.

Photo courtesy Louis Levin & Son, Inc.

Fig. 1. Microscopic view of tiny pressure probe made of .072 and .018 tubing by AiResearch instrumentation lab. on a Levin, Jewelers' Type, Lathe.

Inserted into the small, high-speed machinery, the probe, a miniature reproduction of the common, larger external probes, measures total pressure within a cone of 100 degrees and at velocities reaching the speed of sound.

The probe had to be small enough to prevent disruption of the rapid flow of air through air ducts. Larger probes would not only turbulate the air, but would even create shock waves in air flowing at the speed of sound. Since accurate recording instruments could not be purchased, they were created in the AiResearch instrumentation lab.

A delicate forming tool on the Levin lathe cuts the proper angles in the .012-inch wall of the tube to form a venturi section. This makes possible an accurate reading of the air flow from any angle within the 100-degree cone. The inside surfaces are then polished on the lathe.

A .018 tube from a hypodermic needle pierces the wall of the larger tube and curves into the airstream to carry the total pressure to a monometer, where it is recorded to be read by test laboratory technicians.

AiResearch, one of the largest aircraft accessory manufacturers in the world, specializes in miniaturization. By making possible internal instrumentation of turbo-machinery, the use of the probe allows them to make corrections in air flow design and further improve efficiency of the small gas turbines.

AiResearch has been able to find many delicate, precision uses for the Levin lathe to make test equipment and produce small parts at tolerances far closer than

Fig. 2. Operator at Levin, Jewelers' Type, Lathe in the instrumentation laboratory of AiResearch Manufacturing Company, Los Angeles, forming venturi section in .012-inch wall of .072 tubing to make vital part of company's new microscopic pressure probe.

in the finest watch. Some of these operations are lap-winding armatures for vibration pickup coils that measure turbine wheels within five-millionths of an inch, shaping soapstone coil forms and spinning silver tubing for thermocouple shields.

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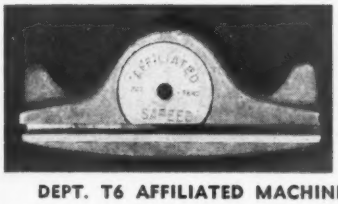

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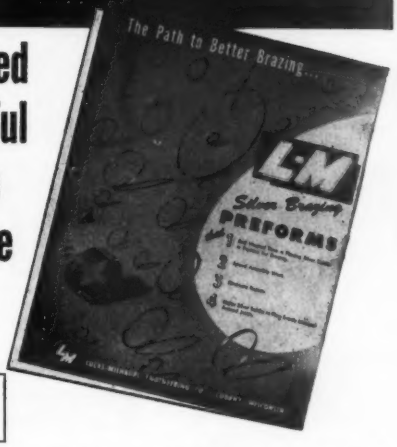

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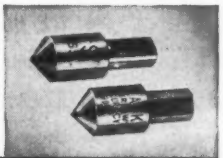

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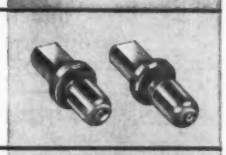

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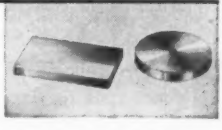

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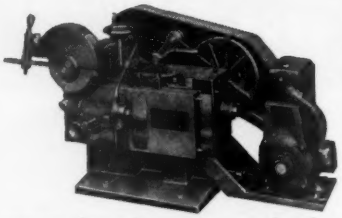

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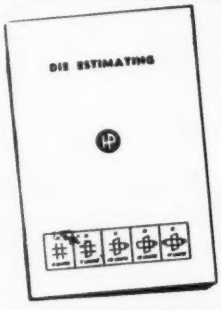

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. . . Grinding Welds, from page 198

Corp., is a delicate job since they must be completely free from leaks. Before brazing, the connection is "veed" out using a

Macklin's A16R8B5 grinding wheel at 3450 R. P. M. After brazing, the seam is ground, Figure 2, and wire brushed both inside, Figure 3, and outside at 3450 R. P. M. Formerly a heavy portable electric grinder was used which was fatiguing and could not be maneuvered in the

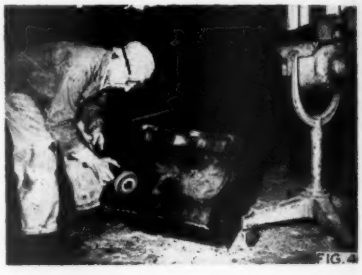
FIG. 4

tight spots on this job. The flexible shaft machine was so light and easy for the operator to handle that he doubled the output of freon receivers.

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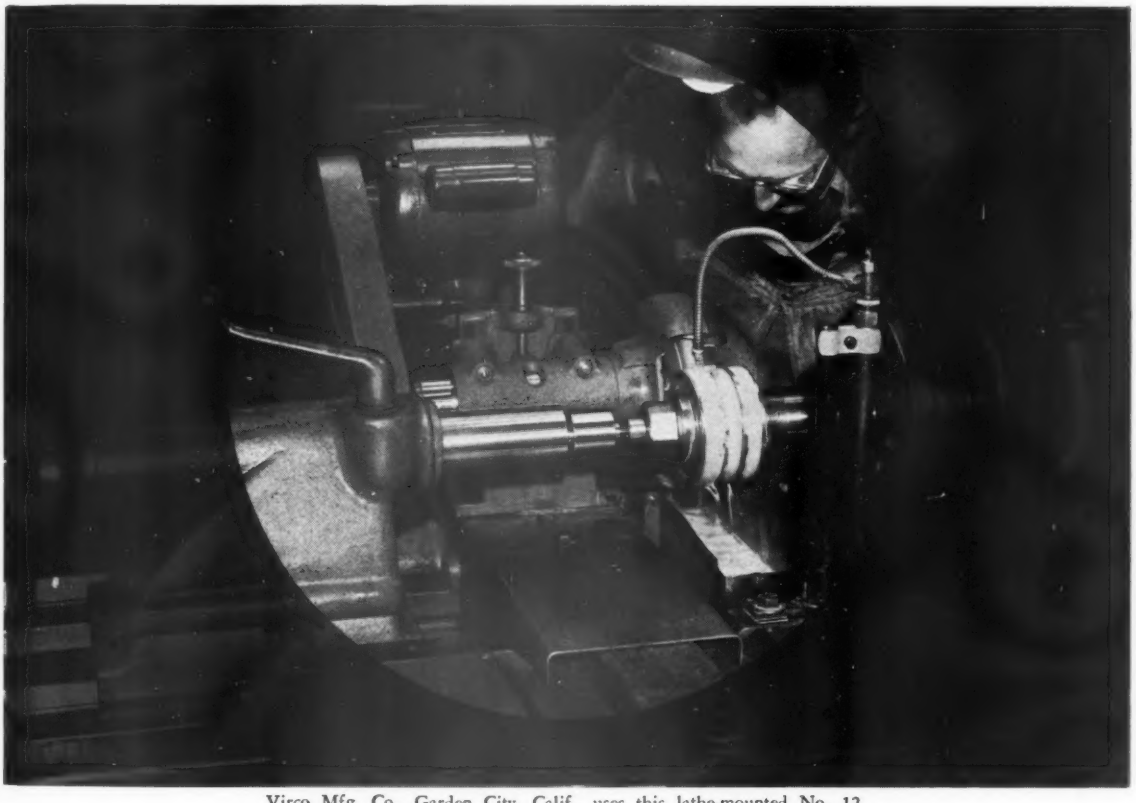

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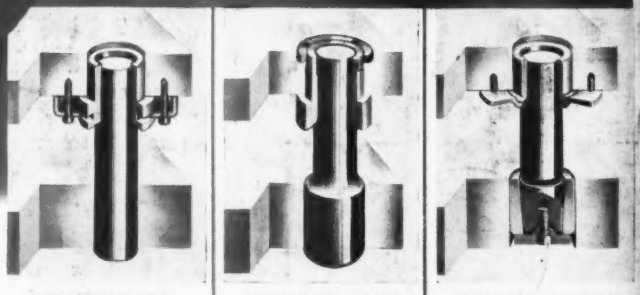

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